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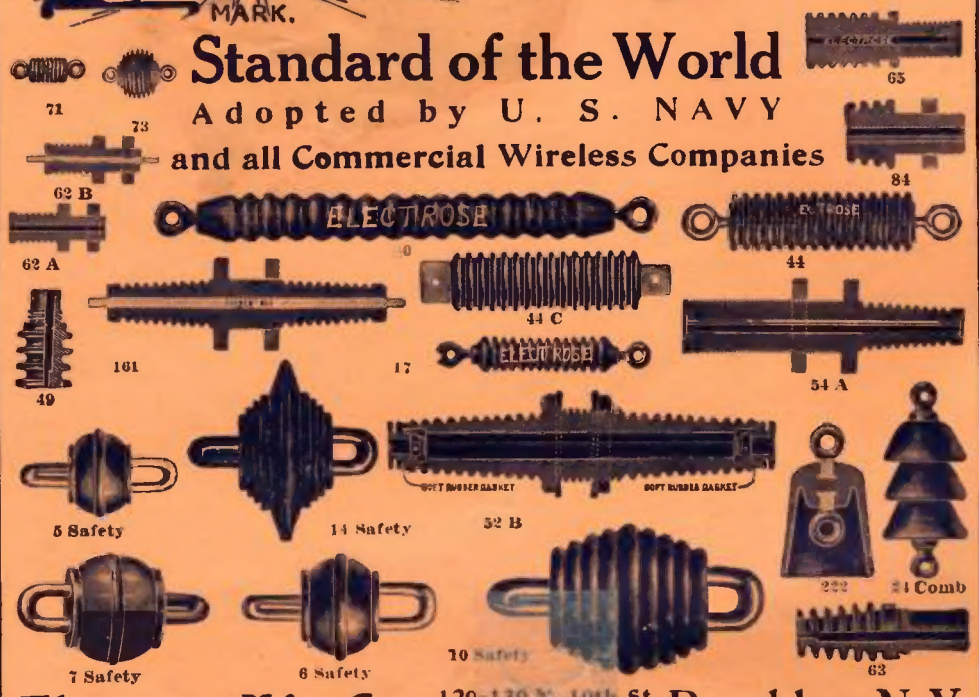

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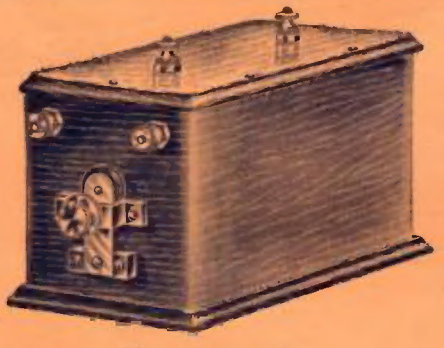

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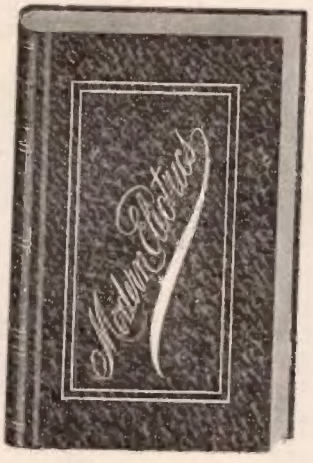

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Modern Electrics

VOL. IV. APRIL, 1911. No. 1.

The Practical Electrician

A Popular Course in Electricity on the Construction of Electrical Apparatus and Experiments to be Conducted with them

By PROFESSOR W. WEILER, of the University of Esslingen, (Germany)
Translation by H. GERNSBACK

CHAPTER I.—Continued.

13. POLARIZATION. ALEXANDER v. HUMBOLDT[1], GAUTHIER-AT 1801. SCHOENBEIN[2] 1839.

A SIMPLE copper-zinc-acidulated-water battery shows a strong generation of hydrogen and a quick

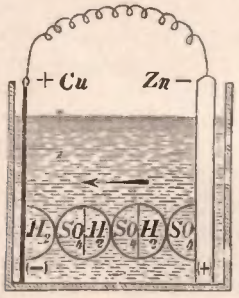

Fig. 14.

drop of its current. A part of the hydrogen accumulates quickly on the copper electrode, Fig. 14, and as it is a bad conductor for electricity, it increases the internal resistance of the battery. This resistance, which the energy created at the zinc electrode must overcome through its transit to the copper electrode, is electro-positive; this reduces the electro-negative force of the copper electrode, and creates an electro-motive counterforce of 1.47 volt.

If, after the decomposition of the water, Fig. 10, we connect the wires of our apparatus with a galvanoscope, the latter will show a current which is opposite to the original battery current and which is termed Polarization current. The galvanic polarization explains why only an extremely small amount of water is decomposed when we use but a single cell battery.

14. LAWS OF POLARIZATION; DEPOLARIZATION.

The polarization increases with the power of the primary (first) current, with the constant power of this current, and with the decreasing size of the electrodes (copper and zinc plates of the battery). The polarization is furthermore dependent on the nature of the electrolyte (the solution of the battery) and it decreases when the temperature of the decomposition cell (the cell in which the water is decomposed) is increased.

This polarization, which is so harmful in a battery, may be counteracted by mechanical or by chemical means:

(a) By making the surface of the negative plate (the copper) rough, by

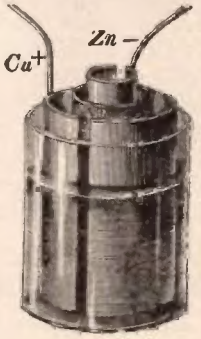

Fig. 15.

agitation of the electrolyte, or by moving or swinging the electrodes.

(b) The only practical means is chemical activity. If one surrounds the plates with a liquid which constant-

1 Humboldt, 1767-1835, statesman and scientist.
2 Schoenbein, C. F., 1799-1868, chemist.

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ly and effectively takes up the hydrogen with great avidity, the problem is solved.

One terms such means depolarizors. Such are the following:

Oxide of copper, sulphate of copper (solution), peroxide of manganese, nitric acid, permanganate of potash, bromin in caustic soda, chromic acid, and others.

The practical demonstration of this was first shown in the Dobereiner (Daniell) battery.

15. THE DOEBEREINER[1]—DANIELL BATTERY,[2] 1836.

Fig. 15 shows the oldest constant battery, that is, a battery which is able to furnish a steady strong current for a long period.

The glass jar contains a porous cup, in which is placed a zinc cylinder which stands in a solution of sulphuric acid, 1 part, water 30 parts. Outside of the porous cup is a copper cylinder in a saturated solution of sulphate of copper (blue stone). The porous cup is made of unglazed clay or porcelain. It is not absolutely necessary to use the glass jar, as the container may be made of copper, which then serves as electrode. In this case, the batteries must stand on insulators, so as not to form a path for the current to go from one container to the other.

MacDonald places the zinc in a porous cup which contains a concentrated solution of cooking salt. The cup stands in a glass jar. Around the cup a heavy spiral of copper wire is placed, and the space between the spiral and container is filled with copper sulphate crystals.

The Daniell battery is of especial interest because it serves as electrical unit, its tension being 1 volt. It gives about 1 ampere (medium large size battery; dimensions of jar 6 by 8 inches).

16. POROUS CONTAINERS FOR BATTERIES.

The usual porous cups are not very expensive, but anyone who wishes to go through the trouble may make them himself.

Select some fine, sifted clay and prepare a plastic mass by mixing the clay with a little water. If one desires to make a cylindrical cup, take a perfectly round stick or mandril and wrap a thin piece of paper around it. Over this place a uniform layer of the plastic clay of about one-eighth to three-sixteenths inch thickness; the bottom is made in the same manner.

After the mass had hardened sufficiently, withdraw the wood form and dry the cylinder thoroughly in the sun or in a hot room or oven. As soon as the cup gives a metallic sound when struck, place it in a good fire and heat it red hot. To make the cup still more porous, mix the clay with pulverized charcoal.

If the porous cup is to be used in copper sulphate battery, heat the cup and place the lower part (one-quarter inch) in hot paraffine and let it soak well into the bottom; this prevents deposition of copper on the treated part. To clean porous cups, stand them in very hot water for three or four hours. To prevent crystals from forming at the top of the cup, soak the cup for about ¼ inch high with hot paraffine, or paint it with shellac. The sulphuric acid level should always be from ¾ to 1 inch higher than the copper sulphate solution, so that the latter, which is heavier, does not mix into the former.

A very good porous container for flat plates is made as follows: Cover the zinc plate with two glass plates of the same size as the zinc plate. Wrap a fine-meshed piece of stiff gauze around the contrivance, and dip it several times into hot glue, until the pores of the gauze are closed with glue. Now pull out the glass plates and zinc plate and dip the container thus formed in a saturated solution of bichromate of potash. Let the cup harden in bright sunlight, as the glue, with the potash in its pores, gives a hard unsoluble compound when exposed to light (Fox Talbot, 1853).

Another good method of making porous cups is as follows: Make two cardboard cylinders, one to be smaller than the other. When placed into each other there should be a space of about ⅛"x3-16" between the two. Fill this space out with liquid, thick plaster of paris. When set and dry, withdraw the

1 Doebereiner, T. W., 1780-1849, Prof. of Physics in Jena.
2 Daniell, John Frederic, 1790-1845, Prof. of Chemistry in London.

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formed cup and dry thoroughly. Plunge the cups in a solution of gelatinous waterglass and dry again. This will give very strong porous cups, which at the same time will have a low resistance, as waterglass is a good conductor.

Parchment paper is also often used in forming containers by folding the parchment in cup form. This makes

Fig. 16.

a very good porous cup, but it is not very strong and tears too easily.

The porous cups, after being in use for an extended period, tend to become clogged with copper deposits, which latter fill up the pores of the cup. This makes the cup useless, and for this reason inventors tried to find other means to overcome this defect. One of the best of such cells using no porous cup or diaphragm is the

17. CALLAVD-KRUEGER BATTERY, 1861.

Fig. 16 shows this battery. Into the jar on the bottom is placed a star of copper or lead foil carrying a well insulated wire as shown. Pieces of blue stone are then placed on the bottom until they cover the star entirely. On top of the crystals pour very slowly and carefully a weak solution of acidulated water, or a solution of cooking salt or magnesium sulphate. After a short time the blue stone dissolves, but as this solution is heavier than the rest of the solution, it does not rise up to the zinc, which it would destroy, but stays always near the copper or lead electrode. The zinc is usually placed into position before the solution is poured in the jar. The zinc shown in Fig. 16 is the invention of G. d'Infreville of New York. It is made in star-form, the ends pointing downward. The small illustrations show the construction; three stars are used in one battery, one star fitting into the next one by means of a conical neck, which engages into the next star. As they fit very tightly there is no danger of falling out. The advantage of this zinc is that each star can be used up to the last piece. The three zincs furthermore give a large surface, increasing the amperage of the battery.

The top star is clamped as shown, the clamp at the same time forming the connection. Such a battery with 3 lbs. of blue stone and a jar of 6″x8″ has an internal resistance of about 0.7 ohm, and furnishes 1.07 volt and 1½ amperes. This battery, once set up must never be moved, as else the liquids will mix.

18. MINOTTO'S BATTERY, 1864.

In this battery a 2-inch layer of fine white sand is placed on top of the blue stone. In all other respects the bat-

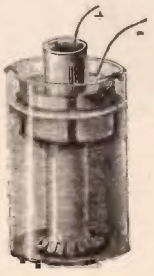

Fig. 17.

tery is the same as the one described previously. However, its internal resistance is quite a little higher.

19. CABARET BATTERY.

Fig. 17 shows this cell. A lead cylinder or large lead pipe from 2″-3″ diameter has one end slotted as shown.

Fig. 18.

The pieces are then bent outward to form a rest on which the pipe stands.

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The upper half of the pipe is well covered with some insulating paint, to prevent local action. The pipe is then filled with blue stone and the cell can be used continuously, as fresh crystals may be filled in at any time without taking the cell apart. The usual solution is used.

20. A SIMPLE BATTERY.

Fig. 18. Take a large lamp-chimney and fit it with a tight-fitting cork at the bottom as shown. Through the center of same a heavy copper wire passes, having at its end a round copper disk. Crystals of blue stone are placed around the plate as shown. The top of the cell is filled with a cork through which also passes a wire, at the end of which is soldered a zinc disk. The distance between the two disks is changed by moving the upper one up or down. The usual solution is used.

Three-quarter-inch cells are able to light a small tungsten lamp for a long time.

21. REYNIER'S POWER BATTERY.

Fig. 19 shows Reynier's battery, which was used a great deal for electric light, etc., before the advent of the dynamo.

The container is made of thin copper sheet, and is 16 inches long, 9 inches

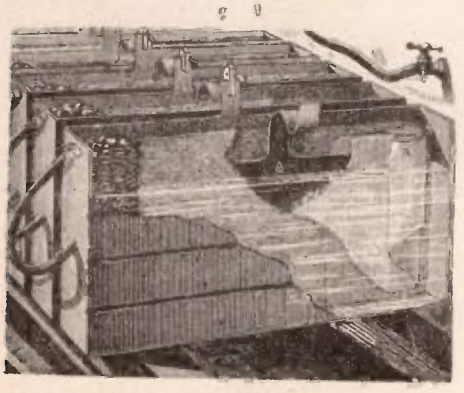

Fig. 19.

high and 2 inches wide. The corners and sides are well soldered. The zinc plate A is 4½ inches shorter than the length of the container, to make room for a small basket as shown; this contains the copper sulphate crystals. The zinc plate itself is wrapped with a few layers of heavy parchment in such a manner as to form a water-tight compartment. This is done by folding the parchment in a certain fashion. A little acidulated water is poured in the parchment container, so that the zinc and the battery, after the outside container has been filled with warm water, is ready for use.

At the narrow side a rubber hose is attached for the following purpose. After the battery has worked for 24 hours continuously the solution becomes saturated with sulphate of zinc, which retards the chemical action; for this reason, once in 24 hours, by means of the rubber hose, we draw off about one quart of the solution and replace with one quart of fresh water. This is the only attention this battery requires, and it can be used to furnish current permanently. The zinc plates may be used up entirely, and besides furnishing current, the battery manufactures pure electrolytic copper on the inside wall of the container, which sells at 16-18 cents per pound. After the battery has been in use for a long time, the copper is peeled off from the inside and is ready to be sold.

The Reynier battery gives 1.10 volts and from 15-20 amperes in short circuit, making it a powerful battery. Like all copper sulphate batteries it **can not be left standing in open circuit.** For this reason one arranges to burn a single lamp constantly.

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See this month's editorial. It will interest you.

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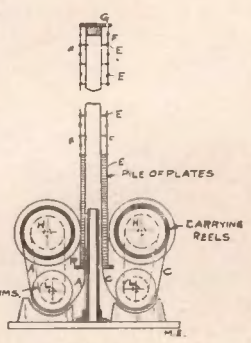
Fontana Mast

THE new Fontana masts are designed to be used wherever a mast is needed which can be set up or taken down in a short time, and they are made on a new principle. Such masts have quite a number of uses, and they are very well suited for wireless work. Up to the present we do not hear of any extensive use of masts of the telescoping kind or the like, probably because these have many disadvantages. In fact, to be of practical use, such a mast must be used in all weathers and its erection should not be hampered by rust or by sand, dust or ice. The tubes of telescopic masts must fit into each other with the least possible play, and this is

-FIG. 1-



-FIG. 2-

one of the reasons why telescopic masts are at a disadvantage. To erect them, too, is not an easy matter and requires more or less complication.

It is owing to the demand for an easily erected mast that the Fontana type was brought out, and it is made by a Berlin company. The principle is that the mast is built up of thin steel strips and no tubing is used, as will be observed. Such steel strips, A, B, fig. 1, go to make up a four-sided column, and each strip interlocks with the adjoining one by means of teeth which fit into each other. We thus have the hollow column, A, B, C, D, with four sides. It is then consolidated by fitting on thin plates, E, at certain intervals, so as to prevent the column from bulging outward. Such plates are made of thin sheet steel and are very light.

The method of mounting the mast is shown in fig. 2. The framework is

Fig. 3. Mast Before Raising.

portable, so that the mast can be transported to any place where it is needed and is then erected. Drums, H, H, carry the steel strips rolled around

Fig. 4. Masts Raised.

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them, and there is a pair of drums for strips A and C, and a corresponding pair lying in the front and rear to hold strips B and D. All four strips are then fed upwards by using the four driving rollers, L, L, etc., using a lower guide plate, R. At the top of the mast there is a cap piece, G. To it are attached the links, F, so that when the cap G rises, the first link picks up one of the bracing plates, E, from the top of the pile. The second link takes off a second plate and so on as the mast continues to rise by the feed from the drums. We thus have the four-sided mast made of the steel strips interlocked at the corners and carrying at intervals the brace plates, which are kept spaced at the right distance by the links. Naturally the spacing of the

Fig. 5. Eighty Foot Mast Raised.

bracing plates depends on the length of the link which is adopted. Spacing the plates closer together will make the mast stronger, or the contrary.

In some cases the Fontana masts are made to carry very heavy weights, such as in army use for scouting and signalling, and a man, or even two, can be raised up bodily to eighty feet in height. However, for wireless work a much lighter mast can be used, seeing that the weight is much less. For this reason the base part is very light, as will be noticed in our views, and the whole is quite portable. The height of the mast before it is raised depends on the height of the pile of section discs. As the side thrust on these plates is small, they can be made very light and are now being made of thin steel sheets with the edges turned over. In this way the links can fit into the hollow spaces between the plates. From 3 to 6 sides can be used for the masts, but for lighter kinds the four-sided form is preferred. When lowered, the total height is from five to six feet, and the space occupied about one square yard, the weight being 350 pounds. Such a mast can be raised in a few minutes to sixty feet in height by turning the hand crank.

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Please tell me, Mister 'Lectric Man,
What does a dynamo?
And if I plant electric bulbs
Will they take root and grow?

Where does the current run to, please?
Are switches made of hair?
And would it rest me if I sat
In an electric chair?

Suppose a blow-out comes along,
Where would it blow to, pray?
And don't they always have dry cells
Where all the convicts stay?

Why does the wire give you shocks?
Won't it give you other things?
And can you show me in a 'phone
The place it keeps its rings?

I asked my papa most of these;
He laughed, and said you knew,
And that you'd like to hear from me;
That's why I'm asking you.

W. A. O. A.

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The "Singing Spark" System of Wireless Telegraphy

IN December, 1906, Prof. Max Wien in Germany published the first account of a phenomenon on which the new method of wireless telegraphy has been based. In order better to illustrate this phenomenon, let us consider the general behavior of two circuits, one of which (i.e., the exciter circuit) comprises a spark-gap, whereas the other circuit is tuned electrically and closely coupled to the former. From its initial maximum amplitude, the oscillation in the exciter circuit rapidly decreases in intensity, so that, after a few oscillations, its energy is communicated to the second circuit and the primary energy becomes exhausted. There will then take place a reflux of energy from the secondary to the primary, until the latter once more contains the whole of the remaining energy, and this cycle is repeated several times. It might be supposed that the spark would be quenched at the very moment the energy had, for the first time, left circuit 1. However, the course of events is, in reality, quite different, the spark being maintained throughout the fluctuations of energy until the oscillation of circuit 2 has vanished almost entirely.

The resistance of a spark-gap is known to rise as the current intensity decreases, and as the current amplitude of the exciter at the end of the first stage falls at a certain moment to zero, the resistance of the spark-gap should then be very high. But this is not found to be the case, and owing, it seems, to the accumulation of heat, the increase in resistance lags behind the reduction in current intensity, so that at the critical moment its maximum value is not yet attained. The secondary circuit then exerts an inductive effect on the primary, and the potential difference produced at the terminals of the spark-gap, owing to the still moderate resistance, results in the production of further sparks. The spark discharges, owing to this reflux of energy, are thus never discontinued, and the resonance curve of such a coupled system always yields, in the place of the fundamental vibration of the tuned system, two new frequencies different from the former, i.e., what are called two coupled waves. Prof. Wien's experiment was as follows:

While examining, by means of a resonance circuit, two such vibratory circuits closely coupled together, of which the primary one contained a very short spark-gap, the Professor found, instead of the usual two coupling waves, a system of three waves. This phenomenon was due to the resistance of the very short spark-gap increasing very rapidly, so that, the vibrations in circuit 1 disappearing rapidly, only those of circuit 2 were left. The latter then could go on vibrating, as an uncoupled individual system with its own frequency of vibration and damping.

Count Arco, of the German Wireless Telegraph Co., took up this experiment with a view to obtaining by its means nearly undamped vibrations, and in conjunction with Mr. Rendahl succeeded in working out the system of wireless telegraphy, termed the "singing-spark" method, of which a short description follows.

The sender consists of an exciter circuit, containing the "quenched spark-gap," as Prof. Wien's arrangement is called. To the exciter circuit is coupled, inductively or otherwise, the tuned antenna system, the coupling between the two circuits being on the one hand so close as to cause the exciter energy to pass as quickly as possible; and, on the other hand, so loose as to damp any waves outside of the secondary main vibration. Coupling efficiencies of 15 per cent. to 20 per cent. are obtained in most cases, the damping of the wave emission being, in the case of slowly-radiating umbrella or T-antennas, about .08 to .1. if the antenna vibrates with its fundamental wave, and only .05 to .03 if the wave be extended to three or four times the fundamental vibration. The condition of the spark-gap does not exert any influence on the frequency of

the second circuit, and accordingly it does not need to be regulated. The period is, on the contrary, absolutely constant, so that resonance can be fully utilized.

In order to control the wave length, either the capacity of condensers or the inductance of inductive coils—or both factors—can be altered, the most convenient method being the variation of inductive coils, as used in wireless telegraphy in the shape of variometers? While the latter had previously only been designed for low pressures and current intensities, so as to be suitable only for the receiver, the German Wireless Telegraph Company succeeded in designing them for receiving very considerable amounts of energy, so that they could be employed in connection with the sender. The sending variometer consists of a fixed disk and a rotary disk, both of which are wound with wire, the windings being arranged either in series or in parallel. When the disks are adjusted so that the fields of the four coils are added, the self-induction will reach a maximum, whereas, in the event of the fields being in opposition, the self-induction is a minimum. The intermediary positions then yield any value comprised between these extremes. Variations in the ratio of 1 : 16 can thus be obtained by a complete rotation and a single change from parallel to series with the variometer.

In the case of a constant primary capacity, the variometer thus allows the wave to be altered from 1 to 4—i.e., from 500 to 2,000 metres; and more complicated constructions even allow of a continuous variation between 1 and 5. In order further to increase the range of waves, either the variometers are changed or the capacity is altered by steps.

As regards the feeding current of the exciter, a maximum number of impulses being desirable, alternating currents of about 500 to 2,000 cycles per second were adopted, giving a succession of 500 to 2,000 spark impulses per second. The regularity of this spark generation can be made so great as to convert the noise of the spark into a real musical sound. The purity of the latter plays an essential part in connection with the utilization of energy and freedom from disturbance in the receiving apparatus.

The alternator current is transformed with a view to charging the exciter capacity to from 4,000 to 70,000 volts, according to the dimensions of the station. This transformation is effected in large stations by means of an induction coil, and in smaller stations by a transformer.

The high-frequency apparatus of the exciter circuit will now be described. The main point in this connection was the design of the quenched spark-gap itself, in which connection many difficulties had to be overcome. *In order to make the succession of sparks quite regular, the electrodes were given the shape of rings, the active surfaces being planed. In order to keep the electrodes at very short distances apart, mica was inserted at the circumference. By distributing the total energy over several spark-gaps, the experimenters were able to convert any amount of energy into electric vibrations. Copper and silver metals of great heat conductivity were chosen as electrode materials. The large number of individual spark-gaps, so far from complicating operations, allows a very simple regulation of the transmitted energy.

In contrast to the trouble caused by the spark-gap, the design of the capacity did not offer any difficulty. As, owing to the rapid quenching of the primary circuit, an excessive care in regard to slight losses was quite superfluous, the experimenters were able to substitute for the Leyden jar the far less efficient paper condenser, of which a sufficient number were connected up in series.

In connection with both the capacity and the third element of the exciter circuit, the inductive coil, maximum safety and minimum volume were the most important points to be considered. The rapid quenching of the exciter circuit ensured an economy previously unknown in the production of high-frequency oscillations, the efficiency coming very near 100 per cent.

Far more difficult was the design of the secondary circuit, as the energy in the latter is kept up for a very long

*See "Quenched Spark-Gap," August, 1909. "Modern Electrics."

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time, while its damping determines the damping of the electric wave given out. The Braun arrangement, in conjunction with slowly radiating, slightly damped antenna, was provisionally adopted, in spite of many drawbacks. Very fine subdivided copper wire of 0.07 mm. diameter was used in winding the secondary circuit. Owing to the very high current intensities in the antenna, very low resistances had to be designed. In the case of the smallest type, the 2-kw. station, the antenna coils were made up of 480 individual conductors connected up in parallel, whereas the 8-kw. station comprises upwards of 3,000 wires, each of which has exactly the same resistance and self-induction.

In order to allow the wave length of the antenna to be varied readily, one section of these coils has been designed with continuously variable self-induction, while the remainder is variable by steps, whereas the old exciter method at most allowed of an extension of about 1.5 times the fundamental vibration of both parts, giving a very extended wave variation.

At the receiving station the detector consists of a contact between a thin graphite point and a plate of lead sulphide or iron peroxide (mostly the latter), which contact has a resistance of several thousand ohms. Such detectors work as current rectifiers, and, without any auxiliary battery, transform alternating currents into waning trains of pulsating continuous current. One thousand such wave trains per second, given out from the musical sender, are received as 1,000 direct-current trains, and, provided the impulses be of sufficient regularity, cause a membrane to give out a musical sound. In order to produce a given sound intensity, a smaller current amplitude in the telephone suffices than in the case of the ordinary irregular impulses perceived as noises.

The musical sound of the sparks imparts to each sender, in addition to its own wave-length and damping, another characteristic. Musically pure sounds are known to be perceptible, even if very feeble, and accordingly allow telegraph operation to be carried on even during the most violent atmospheric disturbances. The operator thus can ascertain, by the pitch of the sound, which station a given wave train comes from. Owing to the large scale of sounds embraced by the ear and the telephone, a very wide interval of variation (from about 200 to 2,000) is thus obtained by very simple means. By means of a resonance relay, the selectivity, as well as the sensitiveness of the arrangement, is increased considerably. The apparatus can also be designed for Morse signals, which are used whenever the subjective method fails.

The Morse receiver is actuated by a resonance relay and ensures a mechanical accumulation of undamped sender impulses. It may be said to be the first graphical receiver free from disturbance which has so far been produced in wireless telegraphy, as well as the first graphical receiver which can be used over about the same range of distances as the acoustic receiver.

The smallest type of apparatus, which requires a primary power of 1.5 kw., in the case of 20 metres (66 feet) antenna height ensures wireless communication to 200 km. (124 miles), and with an antenna of 35 metres (115 feet), to 600 km. distance (373 miles). The 8-kw. apparatus, with an antenna 60 metres high, has a guaranteed range of 2,500—3,000 km. (1550—1865 miles), and that of 20 kw., with 85 metres (279 feet) antenna height, a range of 3,500—4,500 km. (2175—3000 miles) over a level country, or the sea. The 2-kw. station can be mounted as a portable land station in a military vehicle.—*Electrical Review*, London.

UNDERGROUND WIRELESS.

Two German scientists, Drs. Leimbach and Loewy, have successfully applied wireless telegraphy for underground communication. Messages have been sent between the potash mines in the North Harz Mountains, a distance of nearly a mile and a half, at a level of 1,600 feet below the surface.

The messages were so clearly delivered that the scientists conclude that communication at much greater distances is feasible. The discovery is regarded as highly important in case of mine disasters.

PHOTOGRAPHIC PHONOGRAPH.

AN interesting type of phonograph has been invented by a young Russian scientist, S. Lifschitz, and he is now engaged in experiments with it at the Paris University, together with Prof. V. Henri. What is novel about the apparatus is that the sounds are registered entirely by a photographic method, so that there is no mechanical action such as a wax surface would give. To produce the sounds again, the inventor uses the action of an electric motor-driven device, together with compressed air. Referring to the diagrams, a small mirror M is hinged so that it can be operated by the diaphragm D. An arc lamp and lens is used to send a beam of light on the mirror, and it is reflected so as to be thrown on the screen at S. Under the action of the voice,

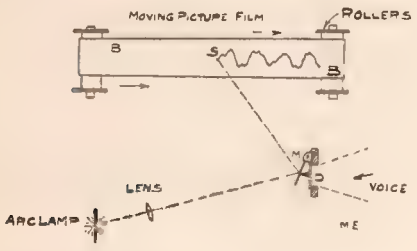
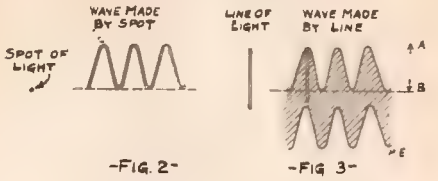
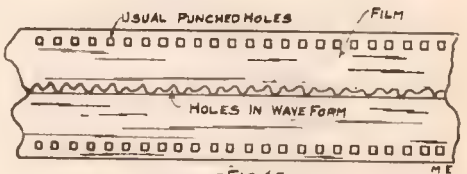


Fig. 1.

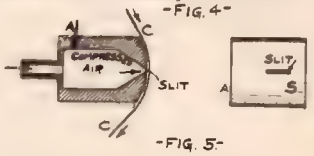
when the mouthpiece is spoken into, the diaphragm vibrates, and the mirror as well, so that we have a movement of the light spot at S. When we use a strip of film mounted on rollers, such as a moving-picture film, the sound waves are registered upon the film, and are shown when this is developed in the photographic bath. What the inventor wished to do was to be able to produce a film which could be afterwards used to give out the voice, as a phonograph does. A spot of light would trace the waves as Fig. 2 shows, but this could not be utilized. He adopts an ingenious method, shown in Fig. 3, using a fine line of light instead of the spot for tracing the waves. When the line moves up and down across the screen we have a certain surface covered, as the shaded area indicates, and on developing the film, this area appears in black. We now suppress all but the part A—B being above the dotted line, as the rest is not needed, and the original film is printed against a second film of bichromated gelatine. As is well



-FIG. 2- -FIG 3-

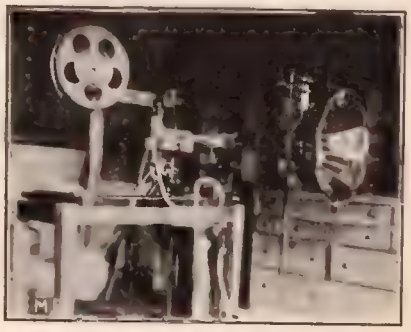


-FIG. 4-



-FIG. 5-

known, such a film becomes insoluble in water wherever the light acts upon it; so that, upon washing it, we dissolve out all the parts corresponding to the wave impression, and obtain a record, as shown in Fig. 4. It now remains to produce the sound of the voice from such a record. To do this, we use a chamber A, which is supplied with compressed air at B by a rubber tube, using generally a steel compressed air bottle. The chamber carries a very narrow slit S upon its curved outer side, and the moving-picture band is made to run along upon the surface at C C, being mounted above and below upon rollers, and driven by a small electric motor. The slit S is adjusted so that it is entirely open when the



Liftschitz Reproducer.

highest part of the wave opening passes before it, and it is quite closed when the wave touches the zero line

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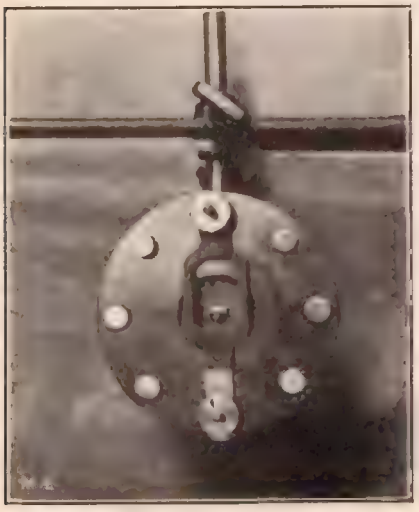
When the film is run rapidly in front of the air stream coming from the slit, the amount of air sent out is varied according to the shape of the waves on the strip, and the result is that we have an imitation of the voice. The effect is very striking, and when the apparatus is perfected, as the inventor expects to do it, there is no doubt that some excellent results will be obtained. It is to be noted that the present apparatus actually reproduces the words which were originally spoken into the recorder, so that the inventor



Transmitter, with Mirror in Center.

has already shown that his device is of practical use. The apparatus was shown before the French Academy of Sciences not long since, and it awakened much interest.

BOISE WIRELESS ASSOCIATION

THE "Boise Wireless Association" was formed March eighth and the following officers elected: Willard Herron, president; Stanard Funsten, vice-president; William Balderston, secretary; Jean Thrailkill, treasurer. Those in the vicinity of Boise are invited to join. The club stations may be known by a blue and white pennant at the top of the aerial mast. Before the meeting adjourned it was unanimously voted that all members join the W. A. O. A. Address

WILLIAM BALDERSTON,
Secretary.
513 N. 6th Street, Boise, Idaho.

$2,500 VERDICT FOR BINNS.

John D. Binns, the wireless telegraph operator of the steamship Republic, whose C. Q. D. messages brought help which saved the passengers and crews of the Republic and the Florida with which it collided, won a $2,500 verdict against the Vitagraph Company of America in the Supreme Court from a jury before Justice Greenbaum. Binns sued for $50,000, under the personal privacy statute, alleging that he had refrained from commercializing his celebrity and detested being misrepresented by the moving picture company.

On the trial, his attorney produced evidence to show that moving picture profits on the films representing an actor in the part of Binns, with some large actual moving pictures of Binn's face taken surreptitiously, were $328,000, or more than the profits on the Jeffries-Johnson prizefight pictures.

AEROPLANE WIRELESS TEST.

Some interesting experiments in wireless work with aeroplanes were made in France not long since. An aeroplane mounted by Henri Farman and a wireless operator carried apparatus including a four-inch spark coil and four storage battery cells. One terminal was connected to the metal work and the other to an aerial consisting of two parallel copper wires 150 feet long hanging down in the rear. The whole outfit weighed forty-five pounds. At the shed there was installed a six hundred foot wire placed horizontally upon 25-foot poles. With this outfit signals could be sent at eight miles' distance.

NOTICE.

Mr. Howard Pratt of Suite No. 5, Columbia Block, Winnipeg, Mass., advises us that he and several young people are about to form a wireless club, and asks to have this notice printed in "Modern Electrics" with a view to having other young people interested in wireless join the new club about to be formed.

Prospective members should write to Mr. Pratt directly.

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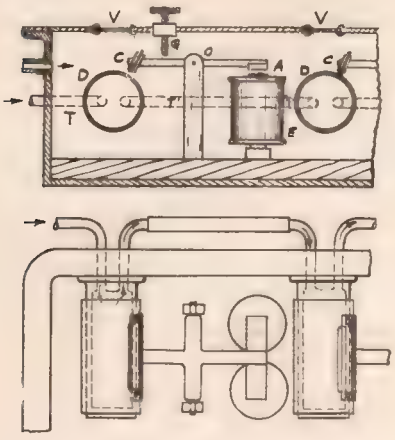
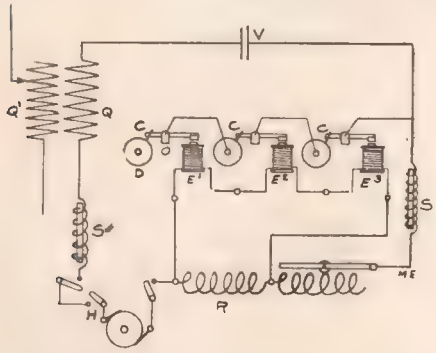
Paris Letter

New Arc Apparatus for Wireless.

THE following is a new arc apparatus for wireless work which is invented in France. It is intended to give a better adjustment of the arcs so as to keep them at the same length, for if the arc is too long there



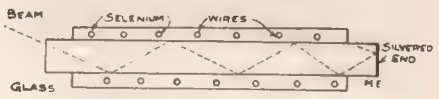
is a bad "frying" noise in the telephone receiver, and when too short, the arc may be put out. Where several arcs are used in series and one of them goes out, the whole series is put out at the same time. The arc is formed between the pieces C and D, using the lifting magnets E so that they draw the arc when the current is put on, by lifting the upper piece C. This upper piece may be a thin carbon strip held in a clamp, or a carbon



disc mounted so as to renew the edge by turning. The details are also seen, showing the carbon C held in the clamp and bearing on a fixed metal cylinder D. This fits about an inner supporting cylinder so that its surface can be also renewed by turning it about at times. The arc can thus run along the length of the carbon piece. It is regulated by the adjustment screw G, looking in at the sight hole V, or else by observing the readings of the instruments. Inside of D there is a cooling cylinder having water circulating in it, and all the cylinders are joined by piping.

The Gripenberg Selenium Cell.

We have already spoken of the new selenium cells made by W. S. Gripenberg, and now illustrate a new form which he uses in order to be able to utilize all the light which falls on the cell. He takes a glass plate and winds a number of turns of wire around it, then coating selenium over the surface so that the selenium lies upon the smooth glass surface. In this kind of cell the surface of the selenium has a brilliant and polished appearance where it comes in contact with the



glass, so that when we throw light on it some of the light is reflected off and thus we do not use all the light of the beam, but lose a part of it. In the present method, the beam is sent in at one end of the glass plate and it is reflected from one part of the selenium to the other several times. As the other end of the glass plate is silvered, the beam does not pass out, but is again sent back so that it is still further reflected, and thus we secure a greater effect from the beam. Mr. Gripenberg used several such cells in parallel so as to obtain a surface of 2.5 square inches and the resistance was but 30 ohms. On 110 volts the current is 4 amperes. When strongly lighted, the resistance drops to 6 ohms and the current is 19 amperes. As to the inertia of the cell, after darkening again for 10 seconds we come back to 60 per cent. of the original value.

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New Receiving Diagram.

The new method shown in the diagram is used for wireless receiving, and it consists of a tuning device, together with suitable means for transferring the detector to a circuit which is coupled with the aerial circuit so as to eliminate any disturbing waves, also a low resistance coil of high inductance which acts to shunt the detector circuits and allows static charges to pass to ground. When the waves to be received have a frequency which is higher than that of the aerial, the detector A is put in the circuit C A C1 as shown in the upper diagram, which is tuned to the right frequency, and when the waves received have less frequency than the aerial, the connections are changed to (2). When we have to do with disturbing waves, the detector is transferred to a secondary circuit coupled with the coil C, adjusted so that the resultant frequency due to

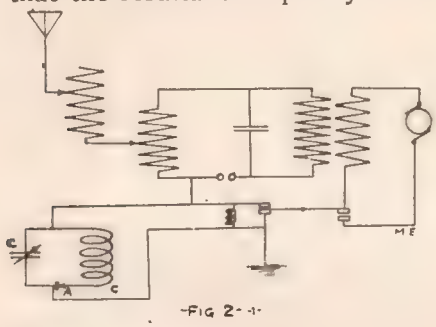


FIG 2-1-

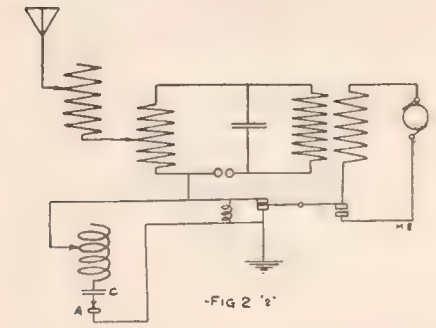
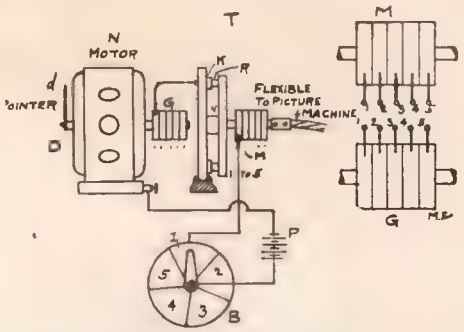


FIG 2 '2'

primary and secondary equals that of the waves to be received.

Synchronous Operation of Phonograph and Moving Pictures.

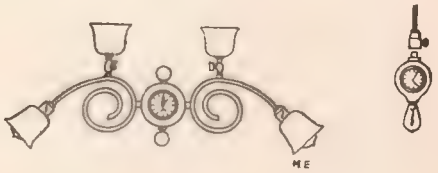
The following method is used in order to operate an electric motor for running a phonograph and a moving picture machine at the same speed so as to have the movements of the person correspond to the words. The phonograph is driven in any suitable way, and it feeds current from a battery P into a small motor N which serves as an indicator. This is done by using 5 segments on the rotary device B connected with the phonograph.



Segment 1 is connected to ring M1 on the commutator T, segment 2 to M2 and so on. The rotating disc V carries five contacts R which work upon five contacts K on a fixed plate so as to work with five rings upon the motor armature. Supposing the device T is fixed, the contacts K and R will be always together, and the phonograph device B sends currents into the coils of the motor armature so as to rotate it. If now the part M R is driven at a certain speed by connecting it with the picture machine, the effect of the battery current on the motor will become less and less, and when the moving picture machine is working at the same speed as the phonograph the effect of the battery current will be zero. A pointer is attached to the motor, and R M is therefore rotated so that this pointer is always at zero. The operator watches the pointer and works the moving picture machine accordingly.

Combined Clock and Electric Light.

A Paris inventor had the idea of combining a self-winding clock and an incandescent lamp fixture is that the current keeps the clock wound up.



Two methods which could be used are shown here. In one case the clock is mounted in a wall fixture, and in the

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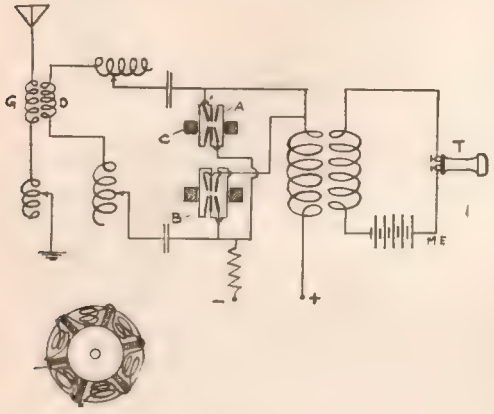
second there is used a smaller clock and it is fitted together with a lamp socket so as to hang from a flexible cord.

New Arc Circuit.

An English inventor uses an arc method which is shown in the diagram, applying direct current to a number of small arcs in series and arranged in the form of a ring. This is placed in the centre of a ring shaped electro-magnet so as to be acted on by the magnetic field. The figure represents



two such arc devices in parallel. The magnet is made up of a number of segments wound with coils and separated by non-magnetic material, and the segments are wound so as to have the same polarity in each of them. As alternating current is used here, this polarity changes at each half-wave of the current.

CONDENSER FOR HIGH POWER TRANSMITTERS.

By Elmer J. Lamb.

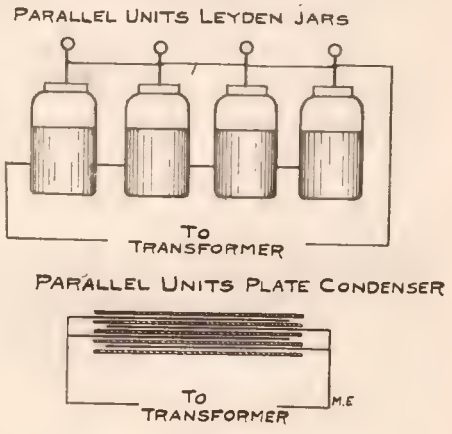
SIMPLE as it is to construct a condenser for a small transmitting set, just so difficult is it for the average experimenter to design and construct a sending capacity which will endure the excessive strains of high voltages occasioned by the use of transformers of one kilowatt and upward.

As a rule, in high-power sets, a condenser is employed known as the series type, which, instead of having its units in parallel (Fig. 1) is divided into two sections having equal capacity, which are connected in series as in Fig. 2.

While a series type condenser necessitates the use of capacity four times the bulk of a parallel type condenser, its use is nevertheless absolutely necessary in the case of the ordinary kind, plated with copper or tin foil, in order that the strain of the high voltage may be lessened to a point where the dielectric, usually glass, will stand the tension with reasonable assurance of not breaking down. This the parallel condenser does, relieving the tension about one-half.

Heat is generated on the surface of the condenser at each charge and discharge, as the result of the hysteresis of the dielectric. Heat is also generated by that phenomenon known as "corona" or brush discharge, a bluish discharge which occurs on the edges of the conducting surfaces; and also in connection with defects of the condenser coating, under blisters and over bare spots, when the current is endeavoring to distribute itself evenly over the surface of the conductors.

As the heat is present only in places, the dielectric as it expands unevenly with the unequal rise in temperature, tends to relieve its internal strain by



—FIG. 1—

fracturing, through which the secondary current from the transformer quickly forces its way, ruining the condenser's efficiency.

Fessenden in his new singing spark transmitter, makes use of a self-healing condenser, using steel plates as conductors, and compressed air under a working pressure of 150 pounds to the square inch as the dielectric, the whole in a steel container. If any arc-

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ing occurs from abnormal voltage, the temperature rises; the compression is greater as a result, the dielectric strength increases up to a point where the arc is extinguished; the current, hampered by the rise in pressure, being no longer able to bridge the gap. By reason of its cost and auxiliary requirements, steel tanks, air compressors, etc., it is unattainable by the experimenter.

There are numerous types of plate condensers, cast in some insulating wax or immersed in oil, which work with great efficiency on small transmitters, but invariably puncture when subjected to the strains of large secondary current. However well they may be coated, the insulating material works in between the glass plates and varies the distance between the conductors; and as the capacity depends directly upon this distance, different points upon the coatings will have different capacity, which will give rise to excessive voltages in places, causing an unequal strain conducive to breakdown.

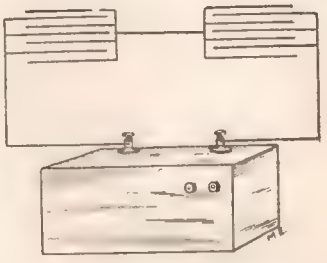
A condenser overcoming these objectionable features is suggested, which also has several additional features to recommend it highly. The dielectric is glass, in the shape of ordinary fruit jars or milk bottles. The conductor, differing radically from the ordinary condenser coating, consists of concentrated salt-water, placed within and without the jars, reaching to a point about three inches from the top. Connection is made to the jars by pieces of sheet metal soldered to copper wires, which, in turn, are connected to a common conductor leading to one side of the transformer, while the other secondary terminal is connected to the metal container in which the jars are placed. In order to prevent any current leakage over the top, or any dissipation of the liquid conductor by evaporation, oil is poured over the surface of the liquid to a depth of ½ inch, as in Fig. 3, which gives the detailed plan of the condenser.

The oil used for this condenser should be an oil of high fire test, free of acid, alkali or other impurities. Boiled linseed oil will do, or there are several other oils; of these, transformer oil, which is used exclusively for transformers, condensers, oil switches, etc.

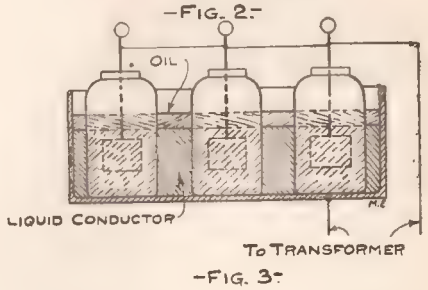
The liquid conductor which forms an elastic coating is always in perfect contact with the surfaces of the dielectric, preventing any corona with its subsequent heating, and also tends to keep the voltage as nearly uniform as possible over the surface of the dielectric, preventing any undue strain.

Any heat developed through dielectric hysteresis is carried to the surface by convection currents, a phenomenon resulting in accordance with

SERIES TYPE CONDENSER



-FIG. 2-



-FIG. 3-

the law of gravity, by which the warmer and lighter solution is displaced by the cold liquid above it. Thence the heat is absorbed by the oil covering and radiated into the air, thus keeping the condenser always cool.

This condenser while not very conducive to elegant appearance, has one great redeeming feature—the manner in which it handles voltages to which any other condenser, built at a cost many times as great, would ordinarily succumb by puncture or fracture. A condenser of this kind is in daily use in the writer's station, in connection with a 25,000 volt transformer with an output of about a kilowatt and a half, using a three-fourths inch gap; which certainly speaks well for it.

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Vol. IV APRIL No. 1

EDITORIAL.

WE wish to call especial attention to the next issue of "Modern Electrics." This will be an unusual number, and will be called "Special Wireless Number." Not alone will the issue have almost twice the volume of the regular number, but it will have among other features a splendid wireless code chart with the Morse, Continental, and Navy codes, printed on heavy paper, to be framed and hung in your wireless station. This code chart alone we have been selling for 10 cents right along and we believe it is worth a great deal more. There will be several other surprises, besides the code chart, never offered before by any magazine, and we are convinced that the May issue will be not alone the best one ever issued by us, but the best one issued by any electrical paper.

On account of the special features and its great volume, this issue will sell for 15 cents at the news stands, and as we anticipate a heavy demand for this number, we urge you to place your order with your newsdealer at once, as only one edition can be run off, and late orders can not be filled, in all probability. The May number will be long remembered by wireless enthusiasts, and for this reason orders should be placed as far ahead as possible.

Regular subscribers will receive this issue without increase of cost. If you ever intended to subscribe for this magazine, NOW is the time to do so.

Special numbers will be issued from time to time at increased cost at the news stands, and for this reason and a great many others, you should be a regular subscriber.

If you are a subscriber, we can be a great deal better in touch with you. We issue special literature from time to time, pamphlets, catalogues of books, etc., which you cannot receive unless your name is on our list. Sometimes, perhaps, a club is to be formed in your town; if we have your name, things will be a great deal easier for all concerned, including yourself, to bring about the desired results. For these and other reasons, it is of great advantage to be a subscriber.

Attention is called to several offers in the advertising section, to induce you to subscribe. Look over them carefully and send your "sub" to-night, before you miss the chance!

Ralph 124C 41 +

By H. Gernsback

(Note. This story, which plays in the year 2660, will run serially during the coming year in MODERN ELECTRICS. It is intended to give the reader as accurate a prophesy of the future as is consistent with the present marvelous growth of science, and the author wishes to call especial attention to the fact that while there may be extremely strange and improbable devices and scenes in this narrative, they are not at all impossible, or outside of the reach of science.)

"HELLO, Edward!"

"Hello, Ralph!"

"Would you mind running over to the laboratory to-morrow A. M.? I have something interesting to show you. Look!"

He stepped to the side of his Telephot, so that his friend could see the strange apparatus standing on a table about ten feet distant from the Telephot.

"What is it?" inquired Edward, stepping closer to his Telephot face-plate, and catching himself, added, "Oh, I know, it is your famous"——

At this juncture, by one of the pranks of "Central," Edward's face disappeared from Ralph's face-plate and his voice was cut off simultaneously. Some one in "Central" had disconnected the line. For a few minutes Ralph tried to have the connection re-established but finally gave up in disgust, saying unkind things about the Teleservice Co. As he was just about to hang up the receiver, a soft light suddenly appeared on the face-plate of his instrument, and immediately after, the face of a strange beautiful young girl. Inasmuch as it was 4 o'clock in the afternoon, he was surprised to see a lamp burning on the table behind her, and by closer inspection also to notice the evening gown of the young lady.

She was as startled as he and both exclaimed simultaneously: "Oh!"

Ralph, catching his breath, could only stammer, "A thousand pardons for intruding; it seems "Central" made a mistake as usual."

Her reply startled him still more:

"Pardon Monsieur, je ne comprends pas!"

"Aha," thought Ralph, "she is French, I'll fix that in a hurry."

He quickly turned the small shining disk of the language-rectifier on his instrument, till the pointer rested on *"French."* He then repeated his question.

"Yes, is it not annoying," he heard her say in perfect English, thanks to the rectifier; but realizing that this was hardly a very polite answer, she added: "but sometimes wrong connections are so delightful!"

He bowed in acknowledgment of this.

"What a strange place you have," she was looking over the many curious devices of Ralph's laboratory as far as the focus of the face-plate allowed.

"May I ask where your delightful laboratory is located?"

"New York," he said pleasantly.

"Just think of it, you would *never* guess where I am," she laughed as she spoke.

"Oh that is not such a terrible hard guess. To begin with, before I rectified your speech, you spoke French, hence you are probably French. Secondly, you have a lamp burning in your room although it is only 4 o'clock in the afternoon here in New York. You also wear evening dress. It must be evening where you live, and inasmuch as the clock on your mantlepiece just points to 9, I would say you are in France, as New York time is five hours ahead of French time."

"How clever. Only not quite right. I am not French, nor do I live in France. I live in Western Switzerland and I am Swiss. Swiss time, you know, is almost the same as French time!"

Both laughed. Suddenly she said:

"Your face looks so familiar to me,

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it seems I must have seen you before."

"That is possible," he admitted, embarrassed. "You probably saw some of my pictures."

"How stupid of me," she exclaimed, "why of course I should have recognized you immediately; you are the great American inventor, Ralph 124C 41+!"

He again smiled his acknowledgment.

"How interesting your work must be and just think how *perfectly* lovely that I should be so fortunate to make your acquaintance in this manner, you, who deny yourself always to the fair sex!"

Suddenly she seemed to have a brilliant idea:

"Would you think me very forward if I asked you for your autograph?"

"Not at all, but I must then ask you for something in return."

"Which is?"

"Your name and address, since you have the advantage in knowing mine already!"

"This is hardly fair, but since you make it a condition I must submit. My name is Alice 212B 423, address Ventalp, Switzerland!"

"Thank you," Ralph replied simply.

He then attached his Telautograph to his instrument while Miss 212B 423 did the same. When both instruments were ready, he signed his name on his Telautograph and he saw his signature appear simultaneously on the distant machine in Switzerland.

"Thank you so much, I am so delighted with your autograph, and," she added proudly, "from what I know of you this must be the first you ever gave to a lady. Am I right?" she added whimsically.

"You are perfectly correct, and what is more, it affords me a very great pleasure indeed to present it to you, since you seem so anxious to have it."

"How exquisite," she held the autograph up, "I have never seen an original signature with the "+" behind the name; only the ten most famous men, I believe, are allowed to have it on our planet, and to think it is my good fortune to have such a famous autograph, and from you!"

Looking up she noticed his extreme embarrassment, and quickly changed the subject.

(To be continued.)

GALENA.

Austin C. Lescarboura.

STRANGE as it may seem, the majority of experimenters know very little of the value of galena as a detector mineral. Some have tried it, and claim that it is of very poor efficiency. As in other things, it must be used correctly in order to obtain from it the faint signals and results which it is capable of rendering.

Galena as used for wireless, is a compound of lead, and comes from mines. The writer has tried many pieces from various sources and finds that samples from the mines at Galena, Ill., are far more sensitive than other pieces. It is a heavy substance, with a bluish or gray shade. It has a very bright mirror finish. The great characteristic of this mineral is that it always breaks in straight surfaces, owing to its crystal formation. Of all the detector minerals, it is probably one of the cheapest.

Unlike silicon, galena cannot be used with a flat point on its surface. Most experimenters make the great mistake of believing that it can be clamped between flat surfaces. The correct means of using it is to have a very fine wire, about No. 30 copper, resting lightly on its surface. The crystal may be soldered in a cup, but great care must be taken not to heat the crystal highly, for it will be ruined in such a case. By changing the position of the wire, the correct adjustment is obtained, when the signals are heard loudest. As galena varies a great deal in sensitiveness, if the first piece tried does not give results, another piece should be tried. Then again, it is advisable to break the piece so that a fresh surface may be obtained. If a piece is handled with the fingers, the natural oil from the body will form a thin coating of oil over the surface which is sufficient to insulate the crystal against receiving weak signals.

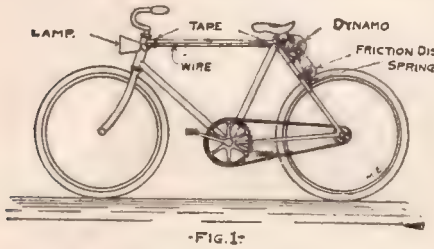
(Continued on Page 39.)

This department has been started with the idea to encourage the experimenter to bring out new ideas. Every reader is welcome to contribute to this department, and new ideas will be welcomed by the Editors. WHEN SENDING IN CONTRIBUTIONS IT IS NECESSARY THAT ONLY ONE SIDE OF THE SHEET IS USED. SKETCH MUST INVARIABLY BE ON A SEPARATE SHEET NOT IN THE TEXT. The description must be as short as possible. Good sketches are not required, as our art department will work out rough sketches submitted from contributors. IT IS THEREFORE NOT NECESSARY FOR CONTRIBUTORS TO SPEND MUCH TIME IN SKETCHING VARIOUS IDEAS. When sending contributions enclose return postage if manuscript is to be returned if not used. ALL CONTRIBUTIONS APPEARING IN THIS DEPARTMENT ARE PAID FOR ON PUBLICATION.

FIRST PRIZE TWO DOLLARS.

A DYNAMO BICYCLE LIGHT.

TO bicycle users who ride after dark, a head light is almost indispensable. Many use oil or carbide lamps, but these are either smoky or are troublesome to maintain.



-FIG. 1-

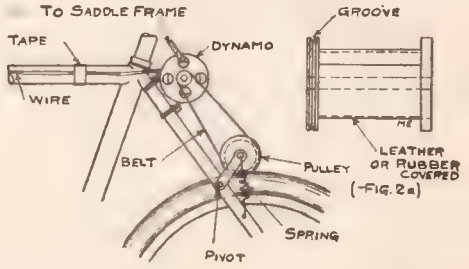
I give below a description of an electric outfit which has none of these disadvantages, and does not require the added expense or weight of batteries.

The "power station" is shown in figures 1 and 2. The dynamo may be of any available small type, and should have a V-shaped or round grooved pulley. It is securely lashed to the rear fork and the seat post; care being taken that it cannot possibly slip downward.

The friction wheel and pulley (Fig. 2a) are made of a wooden spool, grooved at one end for a belt, and covered between the ends with a layer of tape, leather or rubber (leather is best). It is supported by two pivoted metal or wooden arms to which are attached fairly heavy brass springs. These springs hold the friction wheel to the tire at night, when the arms are pushed down, but in the daytime they serve to hold it out of the way, if the arms are pushed back beyond dead centre.

Wires are run from the dynamo on either side of the crossbar to the headlight. This light consists of an ordinary miniature lamp with socket and a reflector. The last named is made from a strip of brass or iron. The sheet is first bent into a conical shape, then riveted, and a notch to fit the bicycle head cut in the small end, as shown in Fig. 3. If brass is used it should be polished and heavily lacquered; if iron, give it a heavy coat of aluminum paint.

The light and reflector are held in place by running a wire through the screw holes in the socket and the eyes



-FIG. 2-

of the reflector, then making a number of turns around the bicycle head. (Figures 1 and 3.)

The candlepower and voltage of the lamp needed are determined by the power of the dynamo used. It is best to have the voltage of the lamp slightly higher than that of the dynamo as a

safeguard against burnt-out lamps. The complete outfit is shown in Fig. 1.

It may sometimes be desirable to insert resistance in the circuit. This may be done by winding a length of broomstick, or other rod, with bare German silver or iron wire and thread, and fastening the whole to the cross-bar with tape.

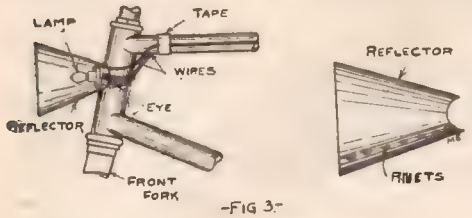


FIG 3.

I would suggest that this arrangement might be used to advantage in generating power for a portable or bicycle wireless set.

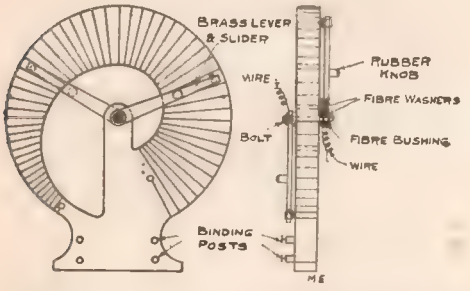
Contributed by

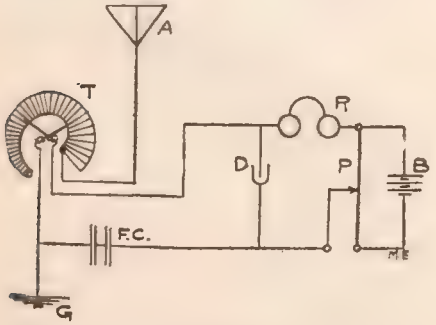
STUART R. WARD.

SECOND PRIZE, ONE DOLLAR.

A ROTARY TUNING COIL.

The following is a description of my double slide, rotary, and very accurate tuner. The circle and base are of 1 inch stock, the circle being wound





with No. 24 enameled wire. The novel part is that each slider works independently, and that they are insulated from one another. It is connected into the circuit the same as any other double slide tuner. Drawing is self-explanatory.

Contributed by

C. J. SEDLAK.

AN ELECTRIC PROTECTIVE SYSTEM.

The most effective burglar and fire alarms are those using a double-balanced relay system. The main trouble about such systems is the high cost of a good double balanced relay.

For the benefit of the few who do not understand this system, I will briefly state it: It consists of a protective closed circuit having a battery, traps and a relay that will close the local alarm circuit if the current in that circuit is increased or decreased. From this you will see that if there is a resistance in the circuit and it is short-circuited, the current will increase in the relay magnet winding. If either or both of the wires are cut, the current stops and the relay closes the circuit on the other side and gives the alarm.

Figure 1 gives a diagram for such a circuit; c, d, e is the double-balanced relay. Battery, b, may be gravity cells or (as the resistance of this circuit is high) dry cells may be used without much deterioration. In either case the correct number of cells will best be found by a little experimenting, as every circuit is of a different resistance.

In fig. 1 g is a closed circuit trap; h is a selenium cell. Fire alarm, f, has a fibre base grooved along the bottom (as shown in fig. 2), to receive the heads of the screws, u, u. These screws are of 8-32 thread and slotted with a circular or hack saw to within three-sixteenths of an inch of the head. They are of brass and are about seven-eighths of an inch long. The springs, z, z, are brass and shaped as shown. Adjust them so that normally they will come together tightly at Y. Between the ends of the springs, at x, place a piece of wax just large enough to separate the points Y Y slightly. Now screw the two brass nuts in place on each screw. They will hold the springs in place and serve as binding posts. It will be readily seen that heat near this fire alarm will soften the wax at x and

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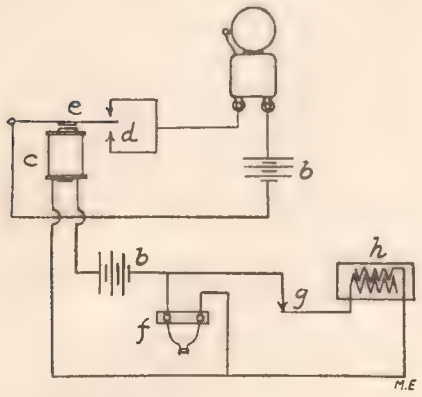
the points Y Y will come together in a clean contact.

The relay is shown in fig. 3. It consists of a 75-ohm Gernsback relay, with the following simple attachment:

Use a small piece of hard rubber or fibre (the former is preferable) one-eighth or three-sixteenths of an inch



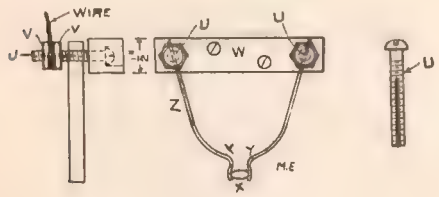
-FIG 1-

thick, the same width as standard at L (fig. 3), and tapering to five-sixteenths of an inch at the other end.

The hole A should be large enough to allow the adjusting screw to pass through without friction. The hole B must be over the centre of the armature nut K, tapped to take a 6-32 screw. This rubber piece is screwed to the standard J by means of three small screws at c, c, c.

The brass washer, E, has a three-sixteenths of an inch hole and a lug, M. A brass nut (8-32) is soldered to the upper side of the washer, as shown in illustration. The adjusting screw, F, with hard rubber thumb piece, can be bought for 15 cents, so that it is hardly worth while to make one.

Of course, while the relay will work without platinum contacts at I and K,

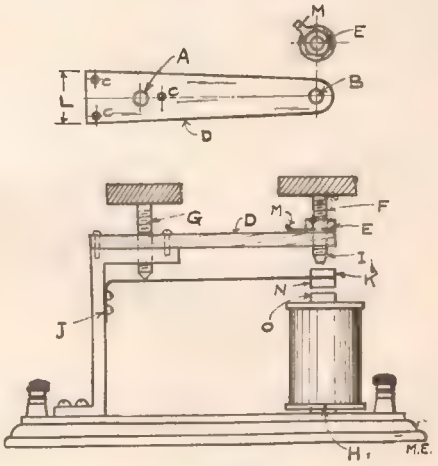


-FIG. 2-

it goes without saying that it would be better with them. Solder a piece of 24 or 28 (B. & S. gauge) wire on the lug M. For protection, thread the wire through a piece of rubber tubing (such as is used in electric bells) and connect the other end of the wire to the same post as wire H.

Now connect up the apparatus as shown in fig. 1 and cover the selenium cell so that no light reaches it; adjust the screw G so that the contacts N and O are about one-sixteenth of an inch apart or less, with battery in the circuit. Now flash a light on the selenium cell and if the battery is right the contacts, N and O, will close the bell circuit. Darken the selenium cell again and adjust the screw, F, so that (with the battery still connected) they almost touch—almost. Open up the circuit by disconnecting one side of the battery. This will release the armature and I and K will close the bell circuit.

From the above, it will be seen that when properly adjusted this system will give the alarm if there is a fire at the place protected, or if the wires are crossed, or either or both sides of the line cut. If a light is flashed on cell h



-FIG. 3-

(which will best be placed near a window for that purpose), it will lower its resistance and operate the relay and give the alarm.

Contributed by

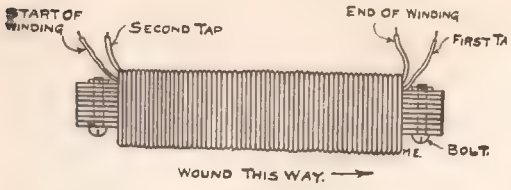
BENTON POTTER

AN ADJUSTABLE REACTANCE COIL.

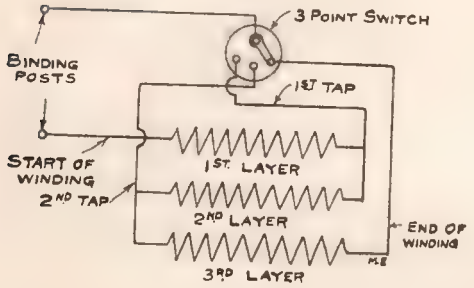
Below is a description of a simple instrument which will stop the flickering of lights in the house, while operating a transformer. It will work very

well with a ½-K. W. transformer coil and electrolytic interrupter.

Make a core one and one-half inches thick from plates of stove pipe iron (20 gauge), eleven inches long and one and one-half inches wide. Clamp the core

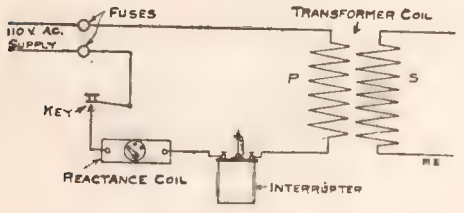


-FIG 1-



-FIG 2-

together and one inch from each end drill a one-half inch hole. Procure two machine bolts seven-sixteenths of an inch in diameter and two inches long,



-FIG 3-

and bolt the plates together tightly. Now, around the core between the bolts, wind a piece of shellacked paper. Then wind on, over the paper, using shellac, three layers of No. 14 B. & S. D. C. C. copper wire, taking out a tap from each layer and connecting with the three-point switch and two binding posts, as shown in fig. 2. The instrument will then have the appearance of fig. 2. Place the wound core in a convenient box. The switch and posts are placed on top of the box. Be careful in connecting the switch so that the first point will correspond to one layer, etc. Connect in transformer circuit, as shown in fig. 3.

Contributed by

HAROLD J. FARRAR.

SCRAPING ENAMELED WIRE.

In making tuning coils many amateurs scrape the enamel off the wire for the sliding contacts with emery paper or sand paper, but in doing this he wire is also worn away. A better method is to take a screwdriver, or one of the tools of a hollow handle tool set, with about a one-eighth-inch or three-sixteenths-inch blade, and move it up and down the tuner in a vertical or oblique position, using a thin strip of wood as a guide (described in previous issues of "Modern Electrics").

This takes the enamel off the wire very quickly, and at the same time does not wear away the wire.

Contributed by

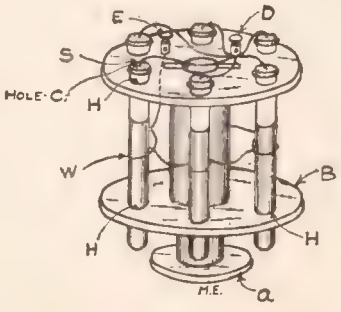
FRED J. WAGER.

LEYDEN JAR CONDENSER.

The materials needed for the construction of this condenser are: two wire spools, one about six inches in diameter, the other three inches, the larger being four inches high, the smaller three inches in height; six test tubes, with corks to fit; enough tinfoil to cover both outer and inner sides of the tubes; two binding posts, and four or five feet of green flexible wire.

To begin construction, smaller spool a is glued to bottom of larger spool b, to form a stand. Then six ¾-inch holes H are bored straight through both butts. Care must be taken to get these holes spaced evenly apart.

The test tubes, after being covered with the tinfoil by gluing, are slipped into the holes in the stand forming the Leyden jars. The corks have a hole c bored through their middle, in which



is inserted a wire S, connecting the inner covering of tinfoil to binding post d. Then wires are wrapped

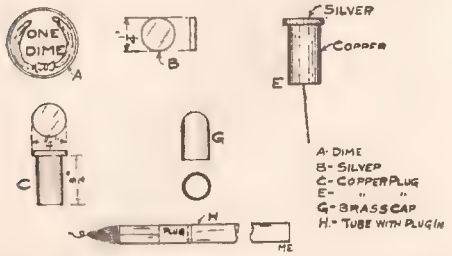
tightly around the outside covering of the tubes w, connecting to binding post e.

After varnishing, the device is ready for work.

Contributed by
JOHN B. BRADY.

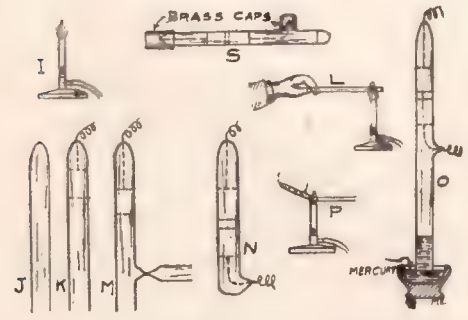
HOW TO MAKE AN EXHAUSTED COHERER.

Procure 44 inches of glass tubing such as is used in a chemical laboratory, about one-quarter of an inch in diameter. Take a dime and cut from it two disks, B, about one-quarter of an inch in diameter. Next get two inches of copper or brass rod one-quarter of



an inch in diameter and cut it into two pieces each one inch long. Solder the silver disks to one end of each of these rods, E, neatly. Next get two pieces of No. 22 platinum wire, each one and a half inches in length; drill a small hole in the other end of the rods and solder the wire in these as in E.

The next is a delicate job. Both of these plugs are filed to fit the tube



snugly and also must be airtight. Extreme care should be taken not to break the tube, as it must be over forty inches long. Next seal the plugs in the tube. You will need a small bowl, some mercury, and burner, also a helper. Hold one end of the tube over the flame until it is red-hot as in L. Then seize with the fingers and draw it out to a point; break this off about one-quarter of an inch from the long end and the end will look like J. Slip one plug through the open end and draw the platinum wire through the small end; hold this over the flame, and the glass will adhere to the platinum. Measure about four inches from the sealed end and hold it in the flame; also hold another piece of tubing in the flame at the same time; when both are hot touch the small piece to the long piece at the four-inch mark and draw out a small tip, as shown at M. Break off the short piece and leave the tip. Place the filings in the tube, made of 94 per cent. nickel and 6 per cent. silver. These can be obtained from coins, using a clean new file. Slip the other plug into position and pull the platinum wire through the tip, as shown at N. Space the plugs one-sixteenth of an inch apart, and seal off this tip as was the first. The tube is now filled with mercury, using a funnel, tap the tube so as to expel all the air bubbles. Fill this tube completely and place your thumb on the end. Invert, and place the open end under the surface of the mercury, then release your thumb. Then with the aid of a helper seal off the tube above the mercury level, as the mercury will drop to the thirty-inch level as in P. Place brass caps over the sealed ends, making contact with the platinum wire. The instrument is now ready for use.

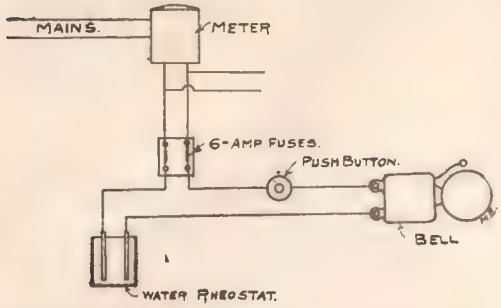
Contributed by
FANNON BEAUCHAMP.

A MONEY-SAVER.

For a number of years I have gone to quite an expense buying dry batteries for bell circuits, so I devised the following way, which works very satisfactorily and eliminates the expense of a bell transformer, which is always using current on the primary side. Tap the lighting circuit when it comes out from the meter, or at any convenient place, and bring the wires to a fuse block. These fuses should be 4 or 6 ampere fuses. All of the wiring from the lighting circuit should be the same as for electric lights, so you will not have any trouble with the wiring inspectors. Now make a water rheostat, as described by the writer on page 453, November issue, 1910; or take two

pieces of sheet zinc or iron and immerse them in a glass fruit jar filled with water.

Next take the bell and disconnect the wire that runs to the vibrator or interrupter, and connect it straight to the second binding post. Then you have two electro-magnets in series with the binding posts as terminals.



The vibrator is left on to adjust the tone of the bell by tightening or loosening the screw.

This is for an alternating current light circuit. Of course if you have direct current, the bell need not be touched.

It is best to cut the hammer off the bell. Connect as in diagram. By adding or decreasing the amount of salt in the rheostat, you can hear the bell a block away, or only around the room. For this outfit the only care required is to fill the rheostat with water as it evaporates. I only have to do this about every four months. Always keep the fuses in place, so as not to endanger the bell by too much current.

Contributed by

STANLEY HYDE.

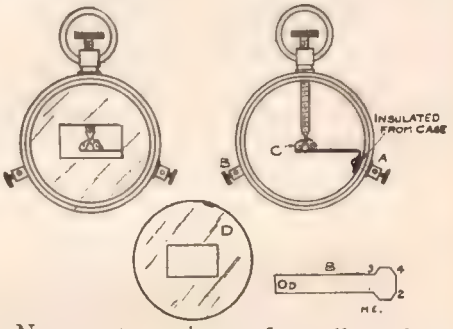
A WATCH CASE DETECTOR.

The following description is of a detector made in a watch case, which has proved more efficient than any detector I have ever used. It can be carried in your pocket, and is very handy for a portable outfit. Get an old dollar watch case and take all the works out, including the stem. With a tap thread the hole where the stem fitted to 8-32 threads. Take a two inch piece of one-eighth inch round brass rod and thread it with 8-32 threads. Now sharpen the end of the rod to a blunt point and screw a small electrose knob onto the other end.

At A on the watch case drill a three-sixteenths inch hole. Get a pair of small binding posts, the smaller the better, and a pair of fibre washers, with holes one-sixteenth of an inch in diameter.

Now take a piece of thin brass one and one-quarter inches long and three-sixteenths of an inch wide, having previously been cut as per diagram B, and bend it in the form as per diagram A, also bending the edges at 1-2 and 3-4 to right angles with the strip. Now, take a piece of mineral (silicon is the best), and place it on the strip at C, diagram A, wedging it into place by bending the edges so as to hold it. Make a one-eighth inch hole in the strip at d, and screw the strip into position, with the binding post on the outside and the strip and the binding post insulated from the watch case by the fibre washers. Care should be taken that the screw does not touch the edge of the hole in the watch case.

At B, diagram A, drill a one-eighth inch hole and screw the second binding post into place. This binding post should not be insulated.



Now cut a piece of cardboard out in the form shown in diagram D, having it so that it will just fit in back of the crystal of the watch.

Assemble the parts of the detector as per the finished diagram, and if you have followed instructions you will have one of the best and most handy detectors that could be wished for.

Contributed by

LOUIS C. ALDRICH.

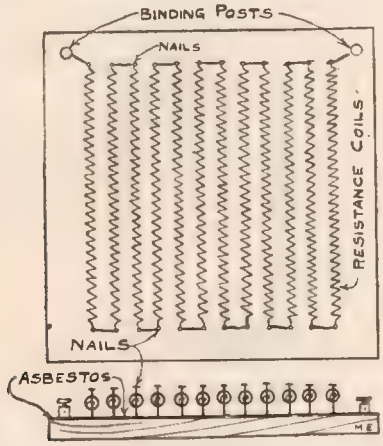
A CHEAP AND EFFECTIVE RHEOSTAT.

A resistance coil which can carry five amperes on 110 volts without overheating can easily be made from the springs of old shade rollers.

Remove the springs from rollers and cut them into coils about six inches long with a cold chisel. Twelve of these coils will be enough, as each coil contains about twenty feet of wire.

For a base use a hardwood board fifteen inches square. Cover one side with asbestos and make two horizontal rows one foot apart of twelve nails each. Leave a space of one inch between the nails.

Now connect the first and second, third and fourth, etc., lower nails with heavy copper wire. Do the same with the second and third, fourth and fifth, etc., nails at the top.



Fasten the resistance coils to nails by slipping the two end turns over the nails.

I have used such a rheostat of nine coils with an arc light, and it worked very successfully.

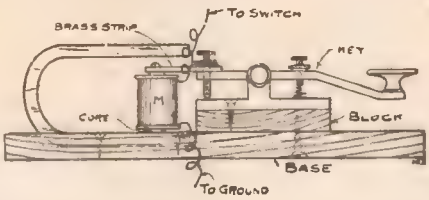
A rheostat of greater resistance or capacity can be made by connecting more coils in series or multiple.

Contributed by
ROBERT P. BAILEY.

A "BATTERYLESS" TELEGRAPH.

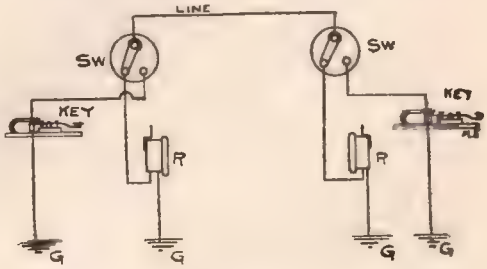
First procure the following material: A common telegraph key, a 20-ohm relay electro magnet and a strong horseshoe magnet from a magneto; also a base and a sub-base, as shown. The drawing is fairly clear, but there are a few points that will need explanation. The relay magnet is fastened to a strip of brass about three inches long, which is secured under the lock nut of the rear adjusting screw of key; also, no contact points are needed, so you can use your oldest key.

That completes the transmitter; now the receiving end is simple. Get a two-point battery switch and a 75-ohm receiver; of course, the more sensitive the receiver, the further the telegraph



will work. The writer tested the above and worked up to one mile with a 75-ohm single pole receiver. The wiring diagram is simple, and the switch is manipulated much the same way as a wireless switch, one point being receiving and the other sending.

Now, as to the power. When the key is depressed the iron screw which fastens the relay electro magnet comes in contact with the magnet, sending lines of force through the core and seting up a current in the coil. This is transmitted along the line wire to the receiver, and produces a click in the same, and when the key is released another click occurs, due to the chang-



ing of polarity in the relay magnet. So, you have a double action key.

Contributed by
EDWARD HUTCHINSON.

HOW TO SOLDER CAST IRON.

It is often asserted that cast iron cannot be soldered, but the following plan will be found satisfactory, provided, of course, that the part be not afterwards subjected to excessive strain or heat. Clean the part to be soldered with a brass scratch brush; then apply the soldering acid, covering the entire surface, following this with a thin coat of tallow, by heating the cast iron just enough to melt it. The part is then

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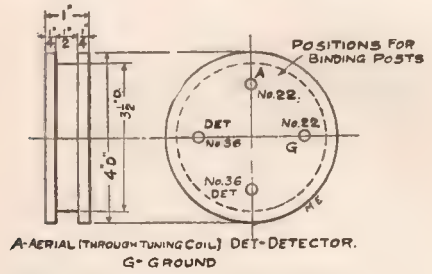
ready for soldering with an ordinary soldering copper and the usual acid.

Contributed by

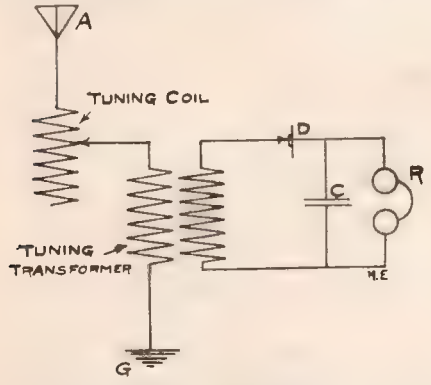
WALTER MILLER.

TUNING TRANSFORMER.

As anybody knows who has tried it, the making of a transformer for tuning is a difficult job, and also a very clumsy one. Another objection is the expense of material. A very efficient substitute can be made as follows: Cut out a disk of wood one inch thick and about four inches in diameter. Then



cut a groove on the circumference about half an inch wide, and a quarter inch deep, as per illustration. Then wind about a hundred turns of No. 36 insulated copper wire on this disk, leaving the ends for attaching to binding posts. Over this wind twenty turns of No. 22 copper wire in the same direction, having insulated it well from the No. 36 wire, also leaving leads for two binding posts. Then on positions indicated in diagram, screw



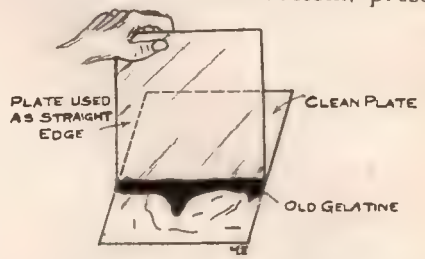
in binding posts, connecting the ends of the wires, one to each binding post, and mark them. Here we now have a condensed form of tuning transformer, with a very short wave length. A tuning coil is now connected in series with this instrument, and we have an arrangement which tunes sharper and with much less trouble than the ordinary tuning transformer, and costing a great deal less, as almost every amateur possesses a tuning coil. The No. 22 wire is connected in the aerial circuit, and the No. 36 in the receiver circuit. I have found this to work as good as a regular tuning transformer

Contributed by

WALLACE ELLS

TO CLEAN CONDENSER PLATES.

While making a condenser from photographic plates some time ago, I discovered what I think is a quick, easy way to clean off the gelatine. After the plates have soaked for about ten minutes in boiling water take one plate and, using it as a straight edge, start at the top of another plate and pass it down to the bottom, pressing



the edge against the plate very firmly. This will take off all or nearly all the gelatine at one sweep. It will be found much quicker than scratching and soaking it off. The black gelatine should never be left on the plates, as it contains silver, which is a conductor, and would tend to increase the brush discharge.

Contributed by

ARTHUR P. MASON.

A DOOR BELL FOR THE DOG.

The following is a description of a door tread for a dog. The dog scratches on the door and thereby closes the circuit which rings a bell. It may be attached to any door-bell. First get a piece of copper strip seven inches by one-half inch. Bend it as shown in fig. 1. Then find the spot where the dog is most likely to scratch, and put three tacks in a row at this place and connect them together with a piece of bare copper wire, as in fig. 2. Then tack the copper strip on the edge of the door with two tacks, and put one tack on the

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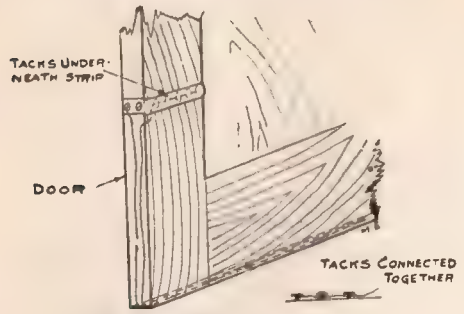
end where the dog is to scratch. Connect a wire to the copper strip and to the tacks which are underneath it down the edge and on the bottom of the door, and run it off at the hinges, and connect to the door bell. One pre-



-FIG 1- -FIG. 2-

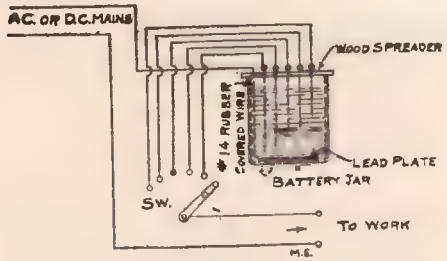
caution is necessary; that is, to see that the copper strip does not touch the tacks, as it should be about one-sixteenth of an inch from them.

Contributed by

ARTHUR T. LEGGETT.

A GOOD WATER RHEOSTAT.

Obtain a gravity battery jar holding about a gallon of water. For the electrodes five pieces of No. 6 copper wire are used. Take a piece of sheet lead and cut it to the required size to fit in the bottom of the jar. Now solder a No. 14 well insulated wire to the lead sheet. The first electrode, made of No. 12 copper wire, should be about a half inch from the lead plate; the other four are arranged about an inch higher from the preceding one. The wires should be placed in a wood spreader



as per sketch. A little salt should be sprinkled in the water until the right amount of current flows. The rheostat is regulated by a five point switch. The wiring is shown in the diagram.

This rheostat is to be used on 110 volts A. C. or D. C., and can be used for running small motors, trains, and with an electrolytic rectifier, can be used to run a spark coil for wireless, etc. The current should be tested first with a voltmeter.

Contributed by

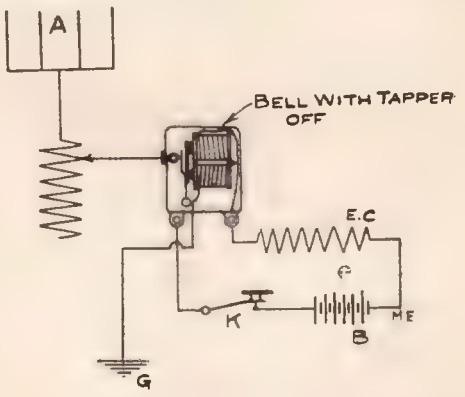
LYLE SCOTT.

IS THIS A RECORD?

I transmit over five miles right along in the mornings (over land) with the following set, using eight batteries, too weak to operate a spark coil.

As will be seen, in sketch, the bell connections must be changed a little and the engine coil ("E. C.") must be used in right place. (This is a gasoline engine coil.)

I use two turns on the helix, which



is made of No. 8 rubber-covered copper wire. My aerial is composed of four aluminum wires two feet apart (No. 14) seventy-five feet high and one hundred ten feet long.

Contributed by

J. P. CAMGROS.

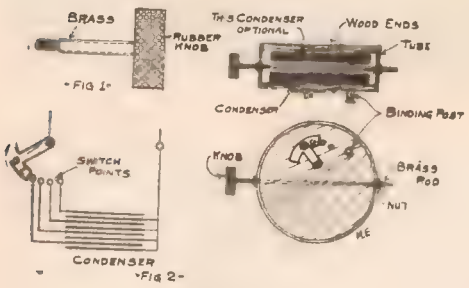
A PORTABLE RECEIVING OUTFIT.

Below is described a portable wireless outfit smaller than a small camera, in which sensitiveness is not sacrificed to saving of space.

It consists of a variometer, a condenser contained within the inner coil, and a detector of any type preferred by the maker.

The variometer consists of a cardboard cylinder, 1⅞x3½ inches in diameter, with the inner cylinder 3 inches outside diameter. Both cylinders are

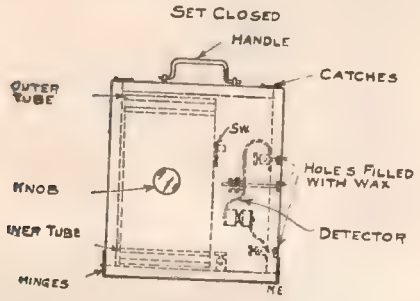
wound with an equal amount of No. 24 B. & S. gauge enameled wire. In placing the inner coil in position, a brass piece as shown in Fig. 1 may be



-Fig 1- -Fig 2-

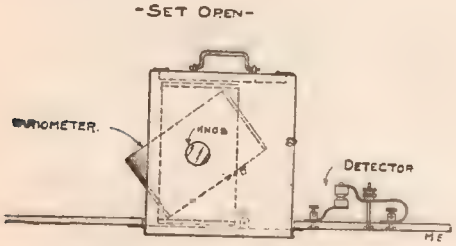
found convenient to screw into the brass rod, if the outer coil is not sufficiently flexible to allow the rod to go through both holes.

The condenser is built up of a number of sheets of tinfoil and paraffined paper or some similar dielectric, as shown. The leads are made to a switch



as shown in Fig. 2, after which the whole condenser is embedded in paraffin. Two condensers would be an improvement.

The mineral detector, either perikon or silicon, is used. The type shown in the drawing is very satisfactory.



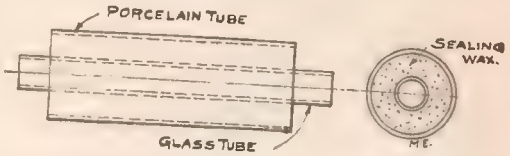
The details of the construction of the box containing the instruments are left to the maker. The over-all dimensions should be at the most a trifle more than 4¼x4¼x3¼ inches. Black stain and a coat of varnish will give a finished appearance.

Contributed by

LEWIS C. MUMFORD.

A VERY GOOD LEAD-IN.

In last month's issue of "Modern Electrics" was a description of a lead-in for use in small stations. Those desiring better insulation will find above diagram very good. The wire is brought through the glass tube; by doing so no soldering is required and no poor connections are possible. Let



the glass tube project out about one inch, thus clearing all surrounding objects.

Contributed by

G. SCHARRENBECK.

CLIP FOR HELICES OF THE RIBBON TYPE.

Take a piece of brass rod about three-eighths inch in diameter and two inches long. One-quarter inch from

one end saw a slit with a hacksaw about half way through. The rest of the construction will be understood by studying the drawing.

Contributed by

GEORGE DIETZ.

AN ADJUSTABLE CONDENSER.

The condenser consists of 10,000 square inches of tin foil and wax paper, made up in seven sections as per sketch; 14 pieces of brass, 1 inch by 1 inch by 3-16 inch, and 2 pieces ½ inch by 3-16 inch by 7¾ inches; 14 binding posts; and 12 plugs to fit holes as per

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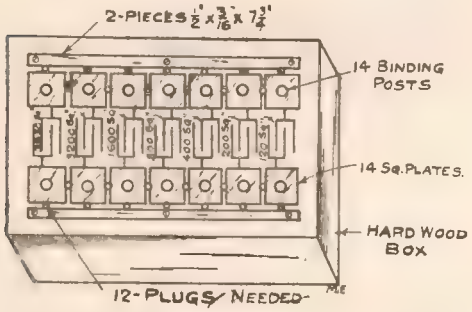
sketch. The condenser is made up in the regular way, first a sheet of wax paper, then a sheet of tin foil, until seven condensers have been made. It will be seen by the sketch, which is very plain, that there is practically no limit to the different capacities that can be obtained. This condenser can be used for primary circuits or tuning, and is a very useful instrument around the laboratory for experimenting purposes. The tinfoil sheets can be cut any size to suit the maker. It is understood

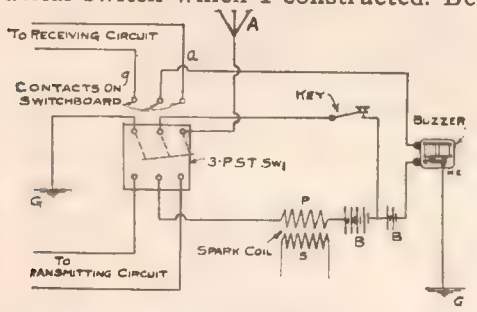


that this condenser cannot be used for secondary purposes.

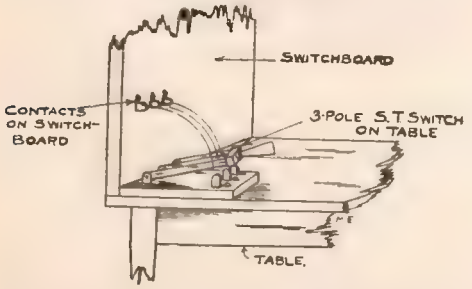
Contributed by JAMES G. FITCHETT.

NOVEL AERIAL SWITCH.

The following is a description of my aerial switch which I constructed. Be-



sides throwing aerial and ground from receiving to transmitting, as most of



them do, this one also closes the test buzzer circuit when thrown for receiving, allowing the transmitting key to be used in the place of a push button to operate the buzzer. Another good feature of this switch is that it opens the primary circuit to the coil while receiving.

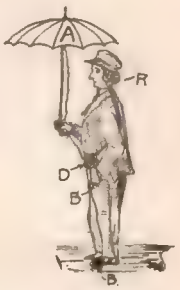
For this switch I secured a three-pole single-throw one and three clamps or contacts. The switch was screwed onto the table at the base of the switchboard, and the contacts were screwed directly to the board, as shown in the sketch, thereby doing away with purchasing two switches as described in the March issue of this paper.

Contributed by MERRITT MOSHER.

PORTABLE WIRELESS OUTFIT.

The following set is very light and can hardly be detected by any one.

1. Aerial is an ordinary umbrella.
2. Telephone receiver.
3. Detector fastened to belt by two "J"-shaped hooks.



4. Small sized battery in pocket.
5. Ground made of a brass plate fastened to the sole of foot by straps.
6. Connection made at back of heel.

When receiving raise umbrella, place foot on damp ground or on a water pipe, or stick toe in pool of water. The ground wire should be placed under the leg of trousers, and aerial wire up the sleeve.

Contributed by H. M'CABE.

ORIGINAL AERIAL SWITCH.

While experimenting with my wireless set the other night, I got a bad shock from my aerial switch, and I decided to take steps so it would not happen again.

I procured my sister's 36-inch switch and attached it to the handle of my aerial switch. This works O. K., the only trouble being that every time anybody cusses by wireless the hair raises up uncanningly.

Contributed by "FIPS."

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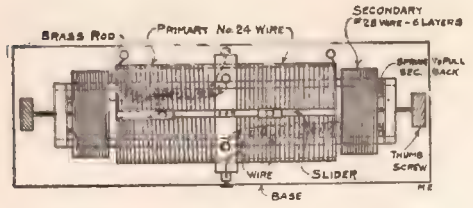
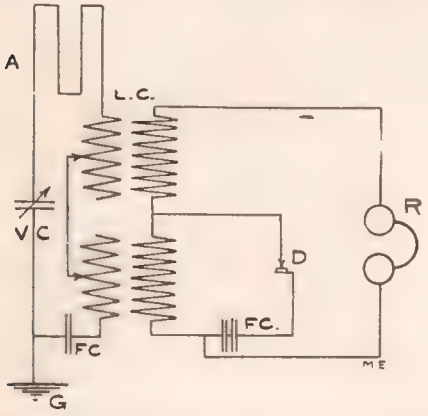
NEW LOOSE COUPLER.

The accompanying are drawings of a loose coupler with two movable secondaries which I have built and used successfully. The drawings explain



themselves. The great selectivity is achieved by the two movable secondaries, and by the variation of turns on primary obtained by two sliders. The new wrinkle consists in the fine



adjustment of the secondaries, which is obtained by the thumb-screw which, when released, causes the secondaries to spring out because of the two springs pulling outward. The "hook-up" enclosed is advised with this tuner.

Contributed by

ROBERT KARLOWA.

TO SOLDER ALUMINIUM WIRE.

In the February issue, page 643, an article by Paul R. Garrison shows a substitute for solder, by covering wire with tinfoil, but this is not a very good connection.

First scrape the wire clean and make the joint, then wind over this one layer of No. 21 B. & S. tinned copper wire, very tightly; then solder the wire, and you will have the best connection possible.

Contributed by

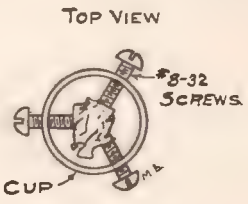
H. L. D.

A SIMPLE DETECTOR CUP.

In making a silicon detector, one of the most important things is to have a cup which will hold the mineral in a fixed condition and still do away with the method of pouring in solder, as this spoils the mineral.

Take the brass cup from an old battery (as in fig. 1) and bore three holes in the side of the right size to take an

-FIG. 1-



-FIG. 2-

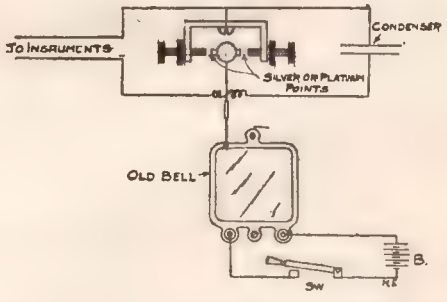
8-32 tap. Obtain three 8-32 screws about three-quarters of an inch long and file the ends flat. Adjusting the three screws, you will find that by adjusting them to the size of the mineral you are able to keep it in a permanent position, and at the same time it can be replaced with little trouble.

Contributed by

E. FRANKLIN LOWE.

INDEPENDENT VIBRATOR.

While glancing through your magazine last evening I noticed a very good Independent Vibrator, but which



seemed to be a little more complicated than the one of which I enclose diagram herewith. I am sending you a copy of same so that you may publish it, and so that it may be of some benefit to other readers of your magaz ne.

Contributed by

JOHN H. KRIMM.

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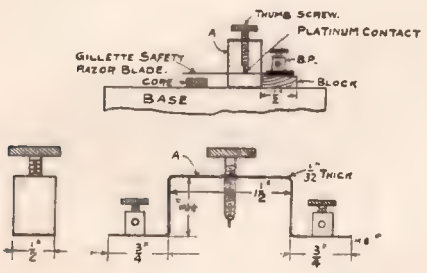
AN ECONOMICAL INDUCTION COIL VIBRATOR.

Square a small block to the size of one-half inch long by three-quarters of an inch wide. The thickness s proportioned to the height of the end of the core emerging out of the coil. Drill a hole in the middle, place properly and screw down the whole as illustration shows. The platinum contact, if put on, is placed as near as possible to the screw or binding post. Then take a strip of brass one-thirty-second of an inch thick, bend as in sketch. Drill holes at each end for screwing. In the middle drill and tap the hole according to the size of the thumb-screw to be



used; screws may be used instead of binding posts.

Fine results are obtained on account of the tightness and stiffness of the Gillette blade.

Contributed by

AMEDIE A. BRASSARD.

STATIC MACHINE AMALGAM.

I have found that if amalgam is put on the rubbers of a static electrical machine, the sparks will be much larger and longer.

The amalgam consists of zinc and mercury. Pour some mercury in a glass jar, and then pour in about the same amount of melted zinc. The quantity of zinc and mercury depends upon the amount wanted. Take a glass rod and mix it thoroughly. When it is mixed and the zinc crushed, mix a very small amount of lard with it until it is pasty, and then spread on rubbers. This is the way I made it, although there are other ways.

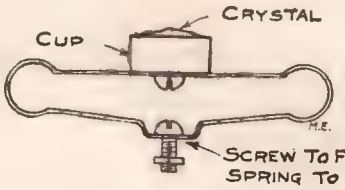
Contributed by

MAX IRWIN CARRUTH.

SPRING ARRANGEMENT FOR DETECTORS.

In making a sensitive mineral detector, the most difficult part is generally the spring arrangement. The method usually used (i. e., mounting the cup on a single spring), allows too much lateral motion.

In the accompanying diagram is shown an arrangement which eliminates this, the motion of the cup being only vertical. It must be made of very



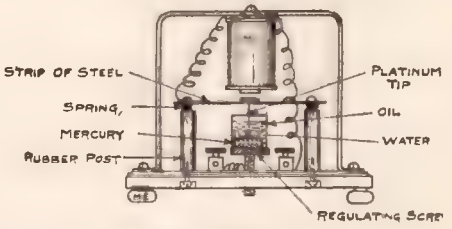
thin and springy brass or phosphor bronze.

Contributed by

ERNEST E. GOURLEY.

MERCURY INTERRUPTER.

Below is a drawing of a mercury interrupter "for rapid and slow vibration, which can be regulated at will." The drawing will explain itself with a little study, and I find it works very well and is a very neat instrument and perfectly noiseless. The magnet is an ordinary bell-electro magnet. The cup containing the mercury is a piece of glass tube about one-half inch long and cemented on a large flat head screw; thus allowing the mercury to get in contact with the screw. The



screw can be regulated both for slow and rapid vibration.

Contributed by

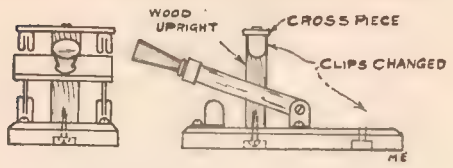
FRED JENSEN.

HOW TO MAKE A GOOD WIRELESS SWITCH.

The accompanying drawing represents a good wireless switch, which I am now using myself to great advantage.

World Radio History

No directions are needed as the dia-



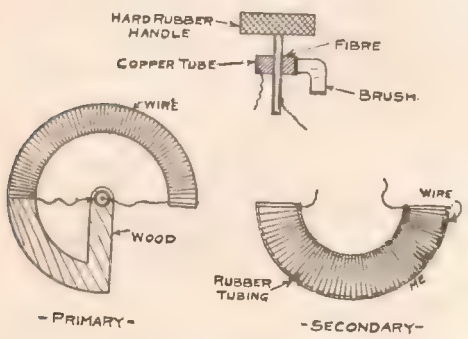
gram is self-explanatory.

Contributed by

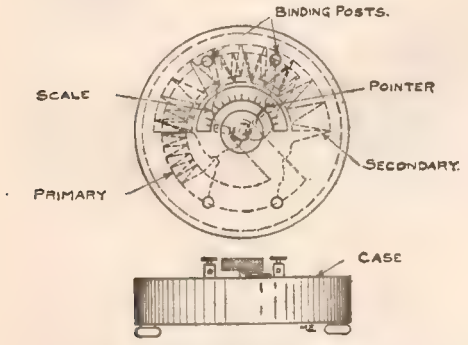
OTTO F. BOYER.

ROTARY LOOSE COUPLER.

The following gives data for con-



struction of a loose coupler. The primary is made of wood, and the secondary of hose.



I think the diagram explains all details.

Contributed by

WM. T. REBENHAULT.

CORRECTION.

In regard to my contribution to the experimental department in the February issue entitled "A Novel Practicing Set," I find that the buzzing continues for a moment in the receivers after the key has been opened, due, no doubt, to residual magnetism in the buzzer magnets. By merely shunting the telephones (in series with the wet cloth) around the buzzer contacts, this trouble is eliminated and the best results obtained.

Contributed by

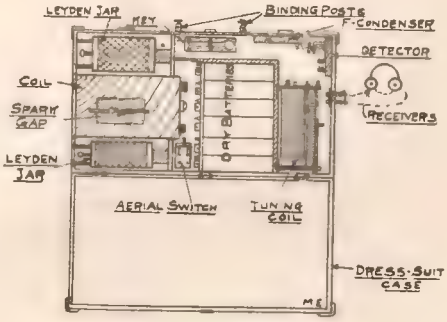
H. W. DAWSON.

A PORTABLE WIRELESS TELEGRAPH OUTFIT.

By Richard H. Foster.

THE uses to which a portable wireless outfit can be put are very numerous, and many operators will no doubt find a good use for the outfit described. When testing the range of your main station the portable outfit will come in handy.

The instruments are all contained in



-FIG. 1-

a dress-suit case, with the exception of the telephone receivers. The apparatus may be arranged to suit the operator, but in this article the writer will describe the way in which he arranged his outfit.

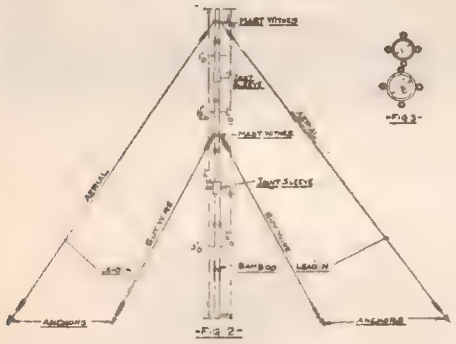
An ordinary sized suit case is the best to use. The lighter the better. The apparatus consists of a one inch spark coil, two leyden jars, spark gap, key, D. P. D. T. knife switch, six dry batteries, or less if possible, silicon detector, fixed condenser, double slide tuning coil, and telephone receivers. The suit case is partitioned off with one-half inch pieces of wood.

A one inch spark coil is as large as is necessary, especially as it holds a record of 90 miles transmission.

The leyden jars are placed on either side of the coil, and are held in place by strips of wood, or hard rubber if possible. The key is mounted near the handle, and the aerial switch opposite on the other side. The dry cells are placed in a com-

partment of their own, and should be fastened as securely as possible.

The silicon detector is used for receiving the wireless signals. This is mounted

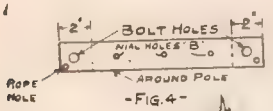


-FIG. 2-

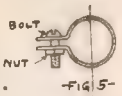
-FIG. 3-

on the right side of the suit case. A double slide tuning coil is used for tuning in stations, as the wavelength of the receiving aerial will be rather short. The larger the tuning coil is the better. A small fixed condenser is fastened to the upper side of the case. Absolutely nothing is fastened to the other half of the suit case, so there will be plenty of room for closing it.

The 'phones are carried separately. The aerial is next constructed, and some of the material will probably have to be

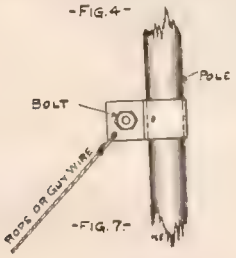


-FIG. 4-



-FIG. 5-

-FIG. 6-



-FIG. 7-

made to order. However, the cost is not exorbitant. Bamboo rod is used in its construction. A bamboo fishing rod could be used if strong enough, but as a rule they are too slender.

The mast is made in three sections, which are joined together in the manner of an ordinary fishing rod. The first section is ten feet long and two inches thick. The second section is ten feet long and is one and one-half inches thick. A mast withe is fastened around the center of this section. It should be one and one-half inches in diameter. Fig. 3 shows the kind of mast withes to use. The third section of the mast is five feet long and one inch in diameter. A mast withe of the same dimension is fastened around the mast about one foot from the top. The height of the mast is twenty-five feet. Four No. 12 aerial wires are fastened to the top mast withe, and are run out as far as they will go. They are fastened in the ground with wooden stakes. The top set of wires should be fifty feet long, and insulated as shown in Fig. 2. Ten-inch electrose insulators should be used. The second set of four wires is fastened to the lower mast withe. These wires are thirty feet long. They should be insulated as shown in Fig. 2.

These aerial wires serve to guy the pole, which is sunk about a foot in the ground. If erected on a high hill, this set will be found to have quite a long range.

It is especially useful in testing out new apparatus. All the aerial wires are of course connected together, with one lead into the instruments.

Twenty or more square feet of wire netting is used for the ground. This is spread over the grass, or else sunk in a brook or pond. This has been proven by test to be a very efficient ground.

The pole can be easily taken apart and strapped to the suit case, and the wire netting can be rolled up into a convenient bundle. This set can be enlarged if desired, but will be found to give excellent results, especially over water, if constructed as described.

WIRELESS MESSAGES SENT BY BRITISH GOVERNMENT.

At last accounts the British Administration sent 34,496 wireless messages during the past nine months. A good part of these were sent by the Crookhaven station in Ireland, as it lies farthest to the westward and is thus largely used for messages sent to vessels in the Atlantic.

W. A. O. A.

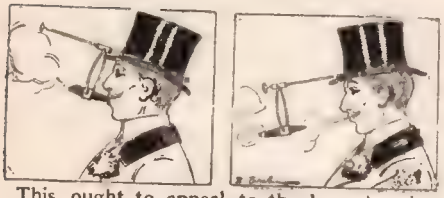
The Wireless Association of America, headed by America's foremost wireless men, has only one purpose: the advancement of "wireless." If you are not a member as yet, do not fail to read the announcement in this issue. *No fees to be paid.*

Flying Sparks

AVIATORS' SAFETY DRESS

A novel invention for aviators. May be worn in the street, when falling from an aeroplane, and when one turns turtle.—Pêle Mêle.

CIGAR TROLLEY

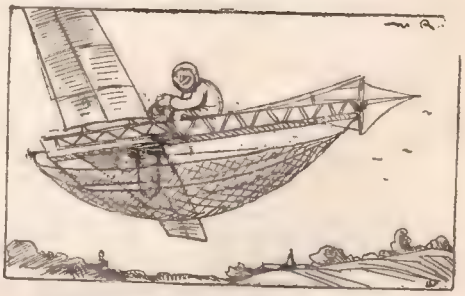


This ought to appeal to the busy American whose hands are occupied, or in cold weather, when it won't be necessary to withdraw the hands from the warm pockets.—Pêle Mêle.

AWFUL

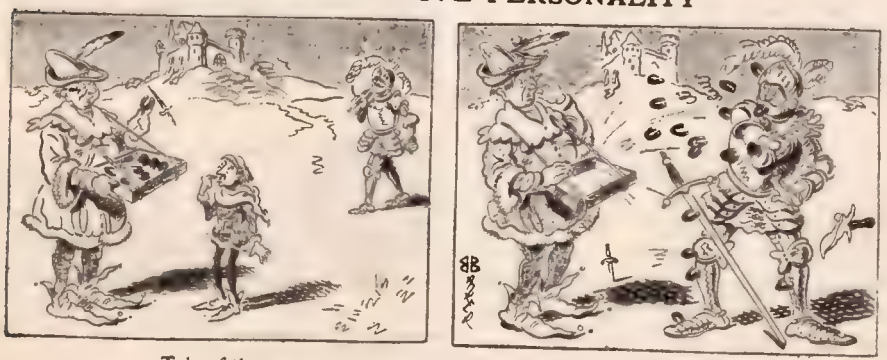
A rat in our office ate half way through the "*Principles of Wireless Telegraphy*" and died. The contents of the book proved too heavy.—"Fips!"

SAFE AT LAST



Mr. Wiseboid has hit upon the simple and unique idea to put a life-net under his aeroplane, to save him when a wing of his aeroplane breaks. Funny no one thought of it before!—Pêle Mêle.

AN ATTRACTIVE PERSONALITY



Tale of the magnet merchant and the passing knight.—*Puck*

Wireless Telegraph Contest

Our Wireless Station and our Laboratory Contest will be continued every month until further notice. The best photograph for each contest is awarded a monthly prize of Three (3) Dollars. If you have a good, clear photograph send it at once; you are doing yourself an injustice if you don't. If you have a wireless station or laboratory (no matter how small) have a photograph taken of it by all means. Photographs not used will be returned in 30 days.

PLEASE NOTE THAT THE DESCRIPTION OF THE STATION MUST NOT BE LONGER THAN 250 WORDS, AND THAT IT IS ESSENTIAL THAT ONLY ONE SIDE OF THE SHEET IS WRITTEN UPON. SHEET MUST BE TYPEWRITTEN OR WRITTEN BY PEN. DO NOT USE PENCIL. NO DESCRIPTION WILL BE ENTERED IN THE CONTEST UNLESS THESE RULES ARE CLOSELY ADHERED TO.

It is also advisable to send two prints of the photograph (one toned dark and one light) so we can have the choice of the one best suited for reproduction.

This competition is open freely to all who may desire to compete, without charge or consideration of any kind. Prospective contestants need not be subscribers for (the publication) in order to be entitled to compete for the prizes offered.

FIRST PRIZE THREE DOLLARS.

THE accompanying illustration shows result obtained in an endeavor to construct a practical and compact wireless station.

With the exception of the one-inch

"Splitdorf" coil, key, and 'phones, all instruments are of my own design and construction.

Sending set consists of one-inch coil with magnetic key, variable choke coil, variable plate condenser, aluminum wire helix and zinc spark-gap.

Receiving set consists of small and large double slide tuning coils with variable and fixed condensers, silicon detector, 'phones and buzzer test set.

Also relay and sounder set with special coherer which has given good results for short distances.

Loop aerial consists of four strands of aluminum wire between chimneys.

Fibre or hard wood was used throughout, aluminum wire and small parts being obtained from the E. I. Co.

I have been a constant reader of "Modern Electrics," "nuf sed."

Contributed by

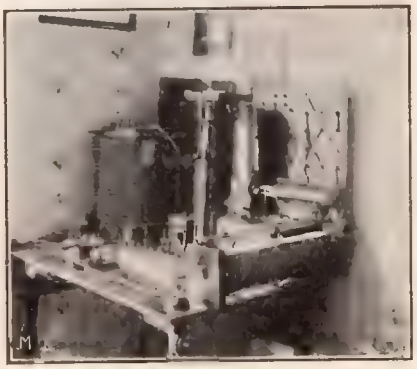
M. B. MINER,

Hartford, Conn.

HONORABLE MENTION.

The picture inclosed shows my wireless set with which I am able to send (with a 90-foot aerial) nine miles, and to receive from all stations on the coast as far south as Cuba and as far north as Rhode Island. I use only about 10 watts in sending, and employ a set of 2,000-ohm receivers in receiving, using the galena detector at present.

I have two receiving tuning coils, an auto transformer coil, shown in a horizontal position, and a secondary,



loose coupled coil, shown in a vertical position. By means of the numerous

switches on the table, either coil and either one of the two detectors may be used, while the panel in back, to which all the receiving apparatus is connected, permits me to change my connections rapidly, permitting me to experiment with numerous systems without having to take the set apart and make new connections. All that has to be done when new connections are to be made is to look up, on a table of connections, the numbers of the binding posts on the panel that are to be connected. For sending I use an 8-volt battery in connection with a one and one-quarter inch spark coil. An E. I. Co. volt-ammeter, which is barely visible, being on the receiving condenser box, tells the voltage and current used. The sending helix is made of brass wire, in the center of which is my zinc spark gap. In the base of this helix frame is located my sending condenser.

Most of the apparatus is home-made, except a few pieces which were impossible for me to make and which I obtained from the E. I. Co. I am at present thinking of using an E. I. Co. 500 watt coil for sending.

Contributed by

HARRY W. GAUSS.

Washington, D. C.

HONORABLE MENTION.

Enclosed you will find photo of my wireless set. The entire apparatus ex-

cept the 'phones, spark coil, and key are home-made.

Many of the instruments were made with the help of "Modern Electrics." I use a one-inch spark coil for sending, and it is seen at the left on the picture; it is operated by dry cells. The key is a common telegraph key with heavy contacts. For sending condenser, I use ten glass plates covered with tinfoil, which gives fairly good service. I use a brass muffled spark gap. The helix is made of one-fourth inch brass ribbon twenty-six feet long. By the aid of a D. P. D. T. switch I can use the transmitting or receiving outfit.

I use a single slide tuning coil that is wound with enameled wire.

The potentiometer has the resistance of about two hundred ohms and it is seen at the left of the helix. I also have a fixed and variable condenser not shown in the picture. With the use of a small switch I can use either a silicon or molybdenite detector, both of which I have made. I use two double pole 75-ohm receivers and a head band made of sheet brass. I completed my instruments in about four months, working at odd times.

My receiving radius is 25 miles. Transmitting radius is 5 miles.

Contributed by

A. W. NICOLAY.

New Mexico.

HONORABLE MENTION.

Enclosed pleased find photo of my "wireless telegraph and telephone station."

My station consists of as follows:—

Transmitting (wireless telegraph): hand feed arc lamp; three (3) microphones, (one of the Magorrona type, and one of my own make, which can be loaded at 110 volts at 6-point amperes on a close circuit without heating).

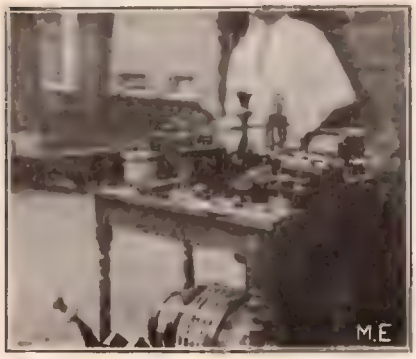
Condenser (large): Two (2) impedence coils (they also act as a magnetic blast for the arc). Variable condenser (of the glass plate type which is immersed in an insulating oil). Oscillation transformer. (Have spoken through this set 12 miles—from my home to Getty square, Yonkers. I am also experimenting on the Selenium cell system and also on the spark system.)

Transmitting (wireless telegraph): ¼ K. W. transformer (made of stove pipes as explained in a recent issue of "Modern Electrics").

One-inch spark coil, rotary spark gap (muffled), magnetic key, Leyden jar battery, anchor gap.

Receiving consists of loose coupler (2,500 metres); tuning coil (800 metres); variable condenser, two (2) fixed cendensers, detectors (peroxide of lead, electrolytic, galena and pericon); potentiometer, receiver (2,000 ohms).

Aerial 100 feet long, 75 feet high.



Four wires on a spreader 17 feet wide.

Contributed by

SAMUEL WEIN.

New York.

HONORABLE MENTION.

Enclosed find photo of my wireless equipment. My instruments are of the E. I. Co.'s make. The sending instruments consist of a one-half inch spark coil, zinc spark-gap, strap key and

helix (which cannot be seen in picture). The current for running the instrument is obtained from seven dry cells.

The receiving instruments are double slide tuning coil of 155 meters, potentiometers, variable and fixed condensers, electrolytic, carborundum, molybdenite detectors, auto coherer, and the head phones are 2,000 ohms resistance.

The aerial is composed of four copper wires, 30 feet long and one and one-half feet apart. The aerial is suspended between two masts forty feet high.

I am a reader of your magazine and I think it is the best on wireless.

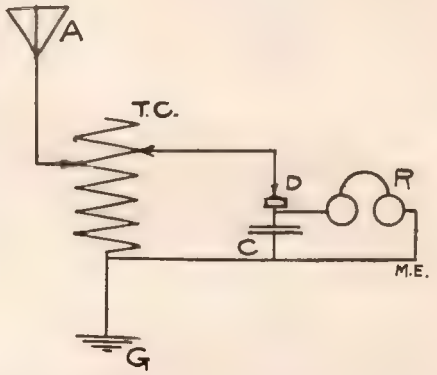
Contributed by

WILLIAM LONG.

GALENA.

(Continued from Page 20.)

The correct diagram to use is given herewith. It is not necessary to use battery. A telephone of 2,000 ohms resistance should be used. A single 3,000 ohm telephone will give splendid results.



If galena is given a fair trial, the amateur will soon be convinced that it is superior to many of the other minerals being used. It has, however, the disadvantage of loosing its adjustment very readily; but its other good features easily counterbalance this fault.

THIS MONTH

begins a new volume. Begin "Modern Electrics" new year right and order today an automatic binder, to preserve your copies.

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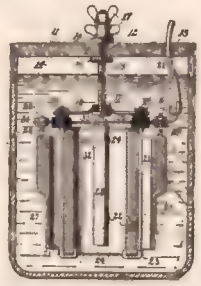
World Radio History

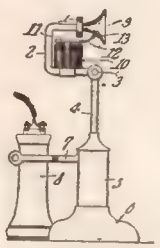
Electrical Patents for the Month

986,847. PRIMARY BATTERY. CHARLES E. SCHOONMAKER, Waterbury, Conn. Filed Feb. 4, 1910. Serial No. 542,068.



1. The combination of a compressed cylindrical oxid of copper negative electrode, a cylindrical zinc positive electrode surrounding the negative electrode, a second zinc positive electrode within the said cylindrical negative electrode, means for operatively connecting the three electrodes together, a single suspending rod for hanging the said assembled elements from the cover of a jar.

986,787 TELEPHONE-SIGNAL. CHARLES L. CHISHOLM, Marysville, New Brunswick, Canada. Filed Sept. 8, 1909. Serial No. 516,412.

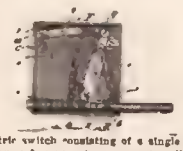


1. An acoustical instrument having a mouth-piece constituting the sounding side of an audible signal, and means for setting the mouth-piece into vibration to cause a signal.

986,083 INDUCTION COIL. RICHARD VARLEY, Englewood, N. J., assignor to The Autocoil Company, a Corporation of New Jersey. Filed May 6, 1909. Serial No. 494,770.

1. An induction coil comprising a core and primary and secondary windings, said primary windings having a distinct group of additional turns or layers disposed upon the body proper of said primary winding at one pole of the coil, said group being in series with the coil and a trembler at such pole.

986,953. ELECTRIC SWITCH. COLUMBUS WOODS and WHITMAN H. SAILER, Peoria, Ill. Filed Dec. 18, 1908. Serial No. 468,252.

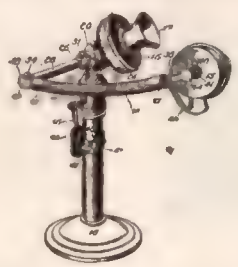


1. An electric switch consisting of a single pivoted arm adapted to have a free arcuate movement on its pivot, electric terminals in the path of movement of the arm at one of the extremes of that movement, a member movable in a line substantially parallel to the chord of the arc described by said arm, and a contractile member connecting the arm and said member.

986,405. TRANSMITTING APPARATUS FOR WIRELESS TELEGRAPHY. POUL OLUF PEDERSEN, Copenhagen, Denmark. Filed Mar. 6, 1907. Serial No. 361,894.

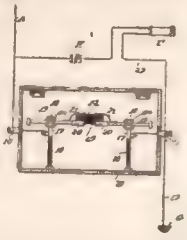
In a transmitting apparatus for wireless telegraphy, an oscillation circuit adapted to produce oscillations continuously, an antenna circuit, a compensation circuit and a key adapted to alternately connect the antenna and the compensating circuit to the oscillating circuit.

987,501 TELEPHONE. WILLIAM V. C. KENYON, Chicago, Ill. Filed June 1, 1908. Serial No. 436,123. Renewed Nov. 23, 1910. Serial No. 594,217.



In combination, a base, a standard projecting therefrom, a transmitter attached to the end of said standard, a rigid shaft projecting laterally from the end of the standard, a flexible self supporting shaft extending forward at an angle from the end of the said rigid shaft, and a receiver permanently attached to the extremity of said flexible shaft.

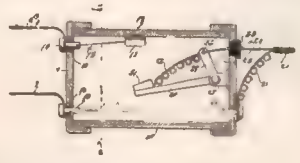
985,854 COHERER. WILLIAM E. D. STOKES, Jr., New York, N. Y., and GEORGE W. DAVIS, Galilee, N. Y., assignors to William E. D. Stokes, New York, N. Y. Filed Oct. 9, 1908. Serial No. 457,014.



1. A coherer having contact faces formed of galena and arsenical copper ore.

986,714. ELECTRIC SWITCH. HORACE HULL, Denver, Colo. Filed June 15, 1908. Serial No. 502,289.

In a circuit closer, a shell, caps closing the ends of said shell, a stationary contact in said shell, a bell crank lever mounted to swing upon one of said caps and having legs of unequal lengths, a contact carried upon the extremity of the longest leg of said bell crank lever and engaging with the stationary contact when the lever is actuated, a combined pull and conductor element connected to the free extremity of the shorter leg of said lever and extending through one of said caps, and a conductor element

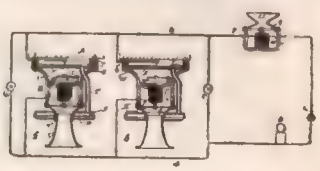


connected to said stationary contact and extending through the other of said caps.

988,044. TELEPHONE-RECEIVER. HARRY E. STOCKMAN, Wheeling, W. Va. Filed May 31, 1909. Serial No. 499,398.

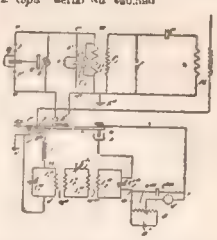
1. In a receiver the combination of the tube [illegible], the disk 12, the ring 1, and one or more magnets for magnetizing the ring and tube with opposite polarity.

986,706. ELECTROTHERMOSTATIC ALARM SYSTEM. ALBERT GOLDSTEIN, New York, N. Y., assignor to International Electric Protection Company, a Corporation of New York. Filed Aug. 6, 1910. Serial No. 575,590.



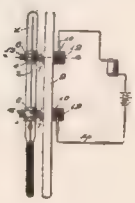
4. The combination in circuit of (1) means for simultaneously producing a frequency current and an alarm, and a circuit closer in shunt with said means; and (2) at a distant station, two alarm devices, one of said devices being responsive and the other irresponsive to said frequency current.

986,552 SPACE TELEGRAPHY. JOHN STONE STONE, Boston, Mass. Original application filed Feb. 27, 1908, Serial No. 418,213. Divided and this application filed Mar. 12, 1908. Serial No. 420,590.



1. In a space telegraph system, a resonant circuit attuned to the frequency of the waves the energy of which is to be received and including a condenser, and an electrolytic receiver connected in shunt to said condenser.

986,023. THERMOSTAT. HARRY Y. NORWOOD, Rochester, N. Y., assignor to Taylor Instrument Companies, Rochester, N. Y., a Corporation of New York. Filed Nov. 29, 1909. Serial No. 530,412.



1. An electrical alarm thermostat embodying a stem of insulating material having a bore therein, an expansible conductor in the bore, a stationary conductor extending through the wall of the stem into the bore, and a contact plate or body on the exterior of the stem, consisting of metal deposited upon the stem by electrolysis and having the outer end of the stationary contact embedded therein.

Original Electrical Inventions for which Letters Patent Have Been Granted for Month Ending March 29, 1911

Copy of any of the above Patents will be mailed upon receipt of 10 cents

Queries and questions pertaining to the electrical arts, addressed to this department, will be published free of charge. Only answers to inquiries of general interest will be published here for the benefit of all readers.

On account of the large amount of inquiries received, it may not be possible to print all the answers in any one issue, as each has to take its turn. Correspondents should bear this in mind when writing.

Common questions will be promptly answered by mail if 10 cents to cover expenses have been enclosed. We can no longer undertake to furnish information by mail free of charge as in the past. There are as many as 150 letters a day now and it would be ruinous for us to continue acting as a free correspondence school.

If a quick reply is wanted by mail, a charge of 15 cents is made for each question. Special information requiring a large amount of calculation and labor cannot be furnished without renumeration. THE ORACLE has no fixed rate for such work, but will inform the correspondent promptly as to the charges involved.

NAME AND ADDRESS MUST ALWAYS BE GIVEN IN ALL LETTERS. WHEN WRITING ONLY ONE SIDE OF QUESTION SHEET MUST BE USED; DIAGRAMS AND DRAWINGS MUST INVARIABLY BE ON A SEPARATE SHEET. NOT MORE THAN THREE QUESTIONS MUST BE ASKED, NOR SHALL THE ORACLE ANSWER MORE THAN THIS NUMBER. NO ATTENTION PAID TO LETTERS NOT OBSERVING ABOVE RULES.

If you want anything electrical and don't know where to get it, THE ORACLE will give you such information free.

WIRELESS QUERIES.

(904.) D. E. McGee, Washington, says:

Q. I.—Please tell me my sending and receiving distance of a ½ K. W. transformer coil, Gernsback interrupter, key, glass-plate condenser 12 plates coated on both sides with tin foil 5x7 inches, E. I. Co. spark gap and a brass ribbon helix with 8 turns. Receiving: Double slide tuner, silicon detector, 2,000 ohm phones, fixed condenser. My aerial is 100 feet high and 100 feet long.

A. 1.—Sending 80-100 miles, receiving 300-400 miles.

Q. 2.—What is my wave length and how do you find it?

A. 2.—120 meters. Multiply height of aerial in meters by 4. This gives the wave length roughly.

Q. 3.—If I had a 1 K. W. transformer, how far could I send? 2 K. W.?

A. 3.—1 K. W.—150 miles; 2 K. W.—200-300 miles.

SPARK COIL.

(905.) B. E. Knappen, Mich., writes:

I have a secondary of a spark coil 5,000 ohms of No. 33 B. & S. S. C. C. wire, run through hot paraffine, wound in 16 sections, 2¼ inches inside diameter, 4 inches outside diameter, 9 inches long.

Q. 1.—What would be the dimensions of a core and primary for this coil to be used in wireless telegraphy? About 2 inch spark.

A. 1.—E½ inches diameter; 2 layers No. 16 for the primary.

Q. 2.—What would be the dimensions of a core and primary for this coil as an open core transformer on 30 cycle current?

A. 2.—Use same winding with an electrolytic interrupter.

RECEIVERS.

(906.) Fred Brandes, Cal., says:

Q. 1.—Would you kindly inform me what my operating radius is with the following instruments: Aerial 55 feet high at both ends, 39 feet long; 4 No. 14 copper wires, 1 foot apart; and a well for a ground connection. A one (1) inch spark coil with batteries for current.

Receiving: Single slide tuning coil, fixed condenser, silicon detector, 100 ohm phone?

A. 1.—Sending 3 to 5 miles; receiving 50 to 75 miles.

Q. 2.—What can I do to make this set a better one?

A. 2.—Add a variable condenser across the tuning coil and use 2,000 ohm phones.

Q. 3.—Can I use 3,000 ohm receivers and a 100 ohm receiver together?

A. 3.—No.

RECEIVING RANGE.

(907.) H. Shotwell, Ill., writes:

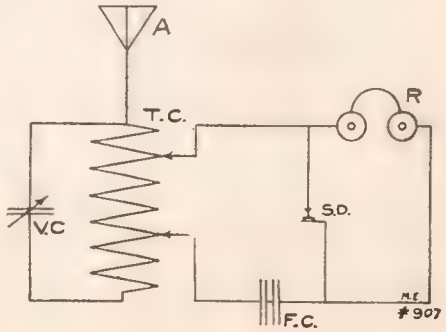
Q. 1.—I have a receiving station, but have not gotten very good results from it.

My outfit consists of a small tuning coil, silicon detector, fixed condenser, variable condenser, a pair of 2,000 ohm receivers, and an aerial of four strands of No. 16 aluminum wire, about 15 inches apart. It is about 55 to 60 feet from the ground.

The farthest call that I have received is 100 miles, from Milwaukee.

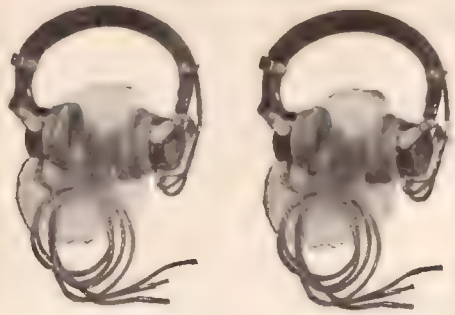
Please give me a diagram of connections and tell me how far I should receive.

A. 1.—See diagram below. 150 to 200 miles.



HOLTZER-CABOT Receivers

For Wireless Operator's Use.



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Total four (4) shares (Par value $40.00), cash with order, all for..... $27.50

P. C. KULLMAN & CO.

The Wireless Brokers, 68 Wall St., New York.

When writing, please mention "Modern Electrics."

CONNECTIONS.

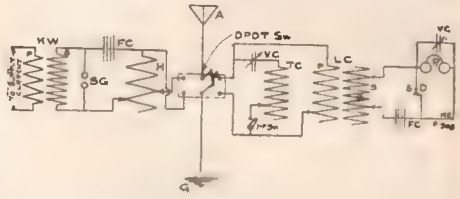
(908.) C. Sudgren, N. Y., writes:

Q. 1.—Show the best connections for following: 2 variable and 1 fixed condensers, tuning coil (2 slides) and loose coupler (2 sliders on large core and 1 on small), mineral detector and 2,000 ohm phones.

Sending end.

½ K. W. transformer, helix (2 clips) spark gap, and condenser.

A. 1.—See the following diagram; which



shows both the sending and receiving outfits connected to aerial switch.

Q. 2.—Which is the best mineral detector?

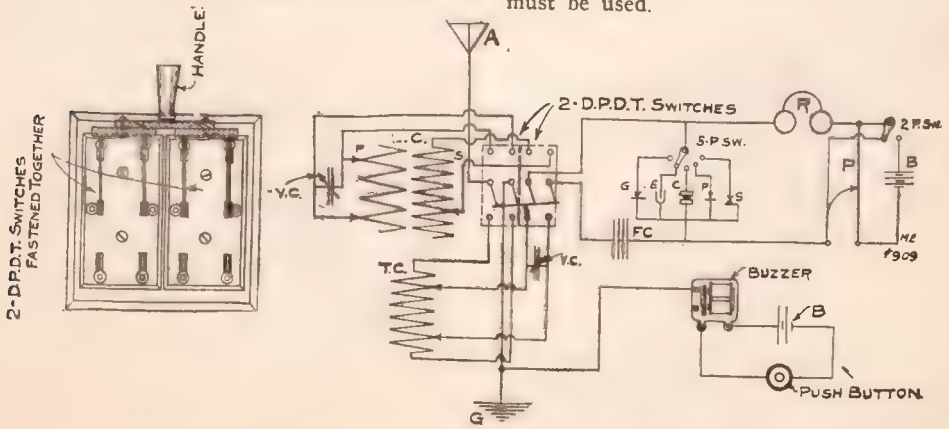
A. 2.—Zincite and copper pyrites (Perikon) probably gives the best results in most circumstances.

18-INCH COIL.

(909.) Harold Arntzen, Colo., wishes to know:

Q. 1.—What would be the receiving distance of the following instruments, electrolytic, silicon, ferron, carborundum and tantalum detectors, 1 double slide tuner, 1 double slide loose coupler with 1 slide on secondary and 2 on primary, 1 potentiometer, 1 fixed condenser, 2 variable condensers, 2 D. P. D. T. switches and an aerial 75 feet high, consisting of 4 No. 12 gauge copper wires each wire 85 feet long stretched one foot apart and from a pole 33 feet high to one 75 feet, receivers 2,000 ohms, 3 Edison primary batteries? Please give diagram of connections so the tuner or loose coupler can be used alone or together, using as many switches as seem possible, using a buzzer test.

A. 1.—800 to 1,000 miles; see diagram below. Note.—2 D. P. D. T. switches connected rigidly together, to form a 4 P. D. T. switch must be used.



World Radio History

Q. 2.—Which is the most sensitive of the following detectors, in order:

Silicon (5), Ferron (4), Electrolytic (1), Carborundum (6), Tantulum (7), Perikon (3), Peroxide of Lead (2), Galena (8), and Silver ore (7) detectors?

A. 2.—The numbers indicate the order in which the various detectors follow as to their sensitiveness.

Q. 3.—How to make a Variometer that will receive up to 1,000 miles and give data for an 18-inch spark coil including, size of wires, kind of insulations and dimensions, cost of hard rubber insulating tube, and sending range with, helix, condenser, key spark gap, and same aerial.

A. 3.—See April, 1910, issue of "Modern Electrics" for variometer. Make your 18-inch coil as follows: Length of core 20 inches, diameter of core 2 inches. Number of Primary Wire No. 10. Inside diameter of tube 2¼ inches. Wall of tube ½ inch, diameter of pies 8¼ inches, number of pies 130; length of secondary 16 inches, weight of secondary wire 19 pounds, number of secondary wire No. 34; primary volts 28. All wires S. S. C. With this coil you should be able to send about 500 miles. Hard rubber tubing may be obtained from the Electro Importing Co., New York.

LOOSE COUPLER.

(910.) Harold K. Bergman, N. Y., writes:

Q. 1.—What should be the length and diameter of the primary and secondary coils of a loose coupled tuner capable of receiving messages from stations having wave lengths up to two thousand (2,000) meters? Also the size of the wire to be used for the primary and secondary windings. I intend to use this coupler with an aerial 75 feet high and 120 feet long composed of six No. 14 copper wire spaced 3½ feet apart. It is connected in straightaway fashion.

A. 1.—Primary coil of one layer No. 20 enamel wire wound on a paper tube five inches in diameter and eight inches long. Secondary coil of 1 layer No. 28 enamel wire on a paper tube four and three-quarters inches in diameter and eight inches long.

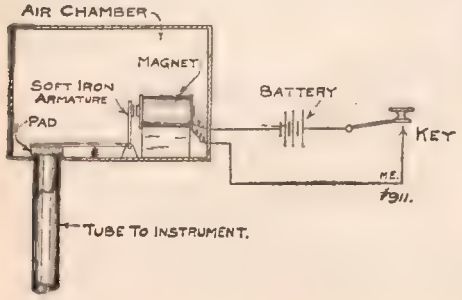
ELECTRIC VALVE OPENER.

(911.) G. Walls, Pa., asks:

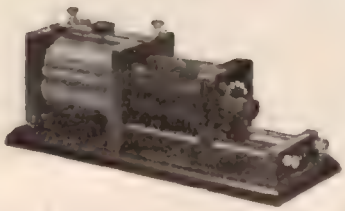
Q. 1.—Will you kindly tell me if the enclosed sample of rubber is suitable for insulating work in electricity?

A. 1.—The enclosed sample being hard rubber, it will give excellent results as an insulator.

Q. 2.—Can you give an idea of some simple contrivance that I can make to pull a



MURDOCK WIRELESS APPARATUS



No. 34

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No. 9461 is made of brown, TRIPLE glazed porcelain, size 2 1-4 x 2 1-2 in., weight 12 oz., for receiving only. Price 10 cents. Per doz., $1.15.

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No. 10341 (patent applied for). This insulator is made of the same material as No. 9461. It is longer and heavier. Its body is pierced by two round holes, through which the wire loops pass. **For sending up to 2-in. spark length.** Will not leak. By placing several of these insulators in series, large spark coils or transformers can be operated without fear of leakage. Size 3 x 2 1-4 in., weight 14 oz. Price each 16 cts. Per doz. $1.85.

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Dynamo Tender	Architectural Draftsman
Wireman	Plumbing & Heating
Mining Engineer	Chemist
Telephone Expert	Bookkeeper
Civil Engineer	Advertising Man
Automobile Running	Civil Service Exams.

Name _____

St. & No. _____

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valve open one inch? Said valve is for use in a musical instrument for very quick work.

A. 2.—As you are not very clear in regard to the action of the valve we are not sure whether the following idea is what you want or not.

MOLYBDENITE DETECTOR.

(912.) Clyde Slatts, Ohio, asks:

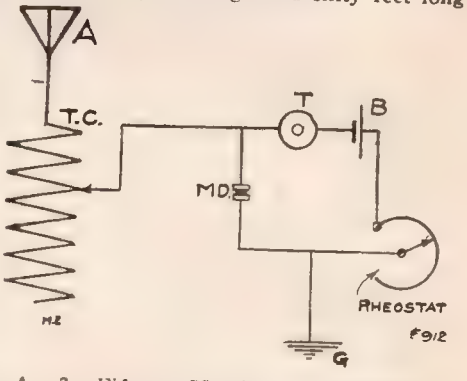
Q. 1.—Could I charge a storage battery having 4 negative plates and 5 positive plates each plate 3 inches by 5 inches in size with a 75 watt dynamo giving 40 to 50 volts? If so how should the battery be connected to the dynamo and how long would it take to give it a full charge?

A. 1.—Your storage battery, instead of having 4 negative plates and 5 positive plates should have 5 negative and 4 positive plates, but with 5 positive plates and an extra negative plate your battery will have a capacity of about 50 A. H. It will require about 30 hours continuous charging with the dynamo mentioned in your question.

Q. 2.—What metal is best for a contact point in a molybdenite detector?

A. 2.—For a molybdenite detector, use 2 brass plates having a very firm contact on the mineral; do not use points.

Q. 3.—How should the following be connected: Single slide tuner, molybdenite detector, rheostat, battery and 75 ohm phone; how far will these instruments receive with an aerial sixty feet high and sixty feet long?



A. 3.—Fifty to 75 miles. See diagram below. We do not advocate the use of a battery and rheostat with molybdenite.

ARC LIGHT INTERFERENCE.

(913.) E. N. Hennessey, Mass., asks:

Q. 1.—How can the buzzing, due probably to the arc light system (the wires of which are near the aerial though not parallel to it), be cut out from a receiving set? The noise is so loud that were the most powerful station in existence nearby, nothing could be heard.

A. 1.—Connect a large capacity variable condenser between the sliders of your tuning coil and adjust same until the buzzing ceases.

VARIABLE CONDENSERS.

(914.) E. Skinner, Cal., writes:

Q. 1.—I have two variable condensers—where would be the best place for them?

A. 1.—Connect them as shown in queries No. 908 or 909.

Q. 2.—Would the two in the aerial shorten the wave length?

A. 2.—No.

FAN MOTOR.

(915.) Morris Grubman, La., states:

Q. 1.—I have a small D. C. fan motor which I wish to convert into a dynamo. Could you answer me through "Modern Electrics" what size wire and how much I would have to use on the armature and fields? The armature is two inches long, laminated; two inches in diameter, 12 slots, each slot being one-quarter inch in diameter. Armature weighs about one pound and the fields weigh about eight pounds. Kindly tell me if I can get about 40 volts and how many amperes from the machine; and at what speed? What size motor will it take to run the machine?

A. 1.—Leave the windings as they are, and you will get about 100 volts (if it was formerly a 110 volt motor) and about ¼ to ½ ampere. In regard to giving the size of wire for 40 volt dynamo, you do not give us enough information in your question, besides we do not think it practicable.

CONDENSER.

(916.) "E. W. F. S.," Baltimore, Md., asks:

Q. 1.—How many pieces of glass would be required to go with a two K. W. transformer each being 18x18, tinfoil 15x15?

A. 1.—45 tinfoil sheets between 46 glass plates.

Q. 2.—What should the height of the aerial to transmit 200 miles with a 2 K. W. transformer, and suitable condenser, rotary spark gap, key, a helix of 40 feet of No. 6 B. & S. copper wire, on 110 volt D. C. with Gernsback interrupter?

A. 2.—With an aerial 75 feet high, you should be able to send 300 miles.

STORAGE BATTERY.

(917.) W. Farnlacher, Cal., writes:

Q. 1.—I am anxious to know how to make a good storage battery, with which to operate a two-inch spark coil. In case there has been an article published how to make an up-to-date storage battery, I would like you to advise me in which issue it has been published.

A. 1.—See our July, 1909, issue of "Modern Electrics," where a very good description of such a battery is given. Price 10 cents.

A GOOD AERIAL.

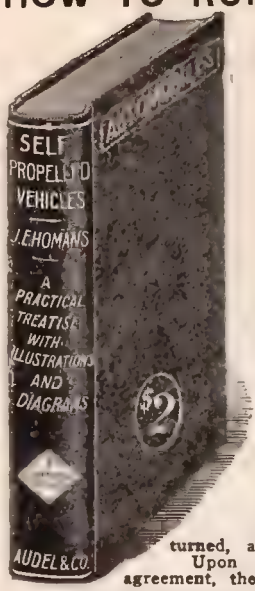
(918.) Albert Sugg, N. Y., writes:

Q. 1.—I am about to erect a wireless telegraph station, but do not know if the aerial I have in mind would be right for all around work.

Enclosed please find a sketch of a water-tower which is about two hundred feet from my station, and one hundred and seventy feet high to top of pole. I am thinking of stringing about twenty wires well insulated from top of pole to edge of roof, back up to bottom of pole. All wires connected at top and bottom, one wire from bottom to station. Would this be the best kind?

A. 1.—On account of the proximity of the steel tank to your aerial wires under conditions that you mention, we advise you to drop

HOW TO RUN AN AUTO



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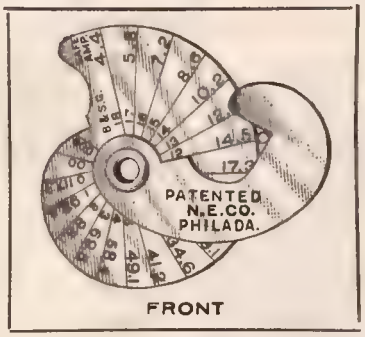

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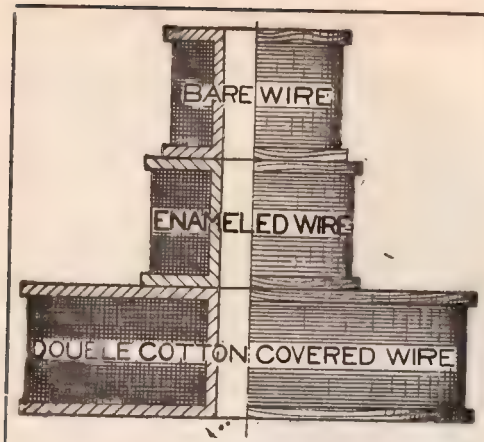

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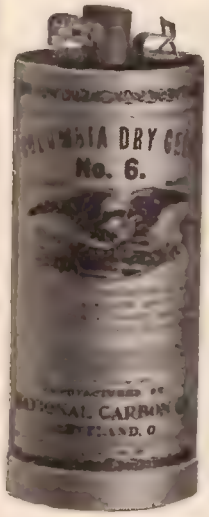

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CLEVELAND, OHIO

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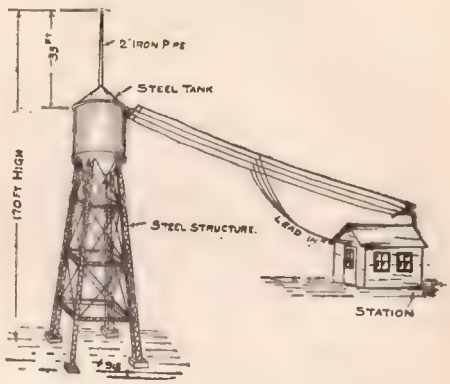
your wires direct from the tank to your station, as shown in accompanying sketch. This should give you a very good aerial.



MARCONI COHERER.

(919.) L. G. Minturn, New York, states:

Q. 1.—I am trying to make a Marconi receiving wireless station, for at least 25 miles. My instruments are all right but cannot make my coherer work. It is a glass tube with corks in each end, and two No. 20 copper wires run through the corks; and I put filings from a nickle and a dime in it, but the filings do not move.

If the principle is not right, please tell me where my mistake is; for if that is right I can connect it from diagrams from magazine that I have.

A. 1.—Your coherer is not constructed correctly; as you should have 2 silver plugs in the tubes instead of fine wires. These plugs should have a high polish, and should be about one-eighth inch apart.

Also do not fill the space between them entirely full of the filings, but only about half full, use very coarse filings. See article on coherer in November, 1910, issue "Modern Electrics."

Q. 2.—Does this system require a relay?

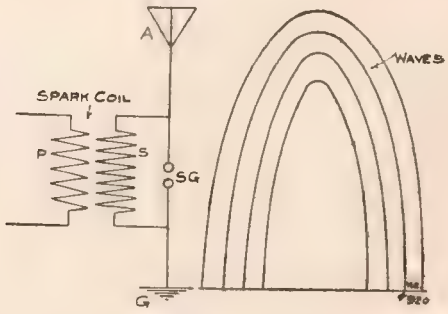
A. 2.—Yes, by all means.

WAVES.

(920.) R. E. Rutherford, Ill., asks:

Q. 1.—Which is the most efficient, a vertical or a horizontal aerial?

A. 1.—The horizontal, is conceded to be the better.



Q. 2.—Is an aerial on a hill more efficient than an aerial in a hollow?

A. 2.—Yes.

Q. 3.—Do the waves from the aerial go up as far as they spread out?

A. 3.—Yes; they travel as shown in the diagram below.

WIRELESS COMPANIES.

(921.) R. G. Siemmers, New York, asks:

Q. 1.—Can you please give me the names and addresses of the makers of Telefunken and Poulsen wireless goods?

A. 1.—Telefunken, Gesellschaft, Berlin, Germany; and the Poulsen Co. at Lingby, Denmark.

LIGHT FROM COIL.

(922.) S. M. Cole, Mich., asks:

Q. I.—Can the current from the secondary of an induction coil or step-up transformer, be used for lighting and heating?

A. 1.—The only light you can get from an Induction Coil or a step-up transformer is from a Geissler Tube; which, of course, is not practical for ordinary use.

Q. 2.—Can the same current excite magnetism in iron?

A. 2.—Yes, to a certain degree.

TWO-INCH COIL.

(923.) C. W. Foley, Ill., writes:

Q. 1.—Please tell me the length, weight and diameter of the core, the size of wire, and number of layers in the primary, and size of wire, number of sections and weight of each, in the secondary, of a two-inch coil?

A. 1.—The dimensions for a two-inch induction coil are as follows: Core 11 inches long by 1⅛ inches in diameter, weight 2.32 pounds, primary composed of 2 layers of No. 14 B. S., D. C. Wire; and secondary 4 pounds No. 33 B. & S., S. S. C. wire, wound in 8 sections. Insulating tube over primary should be 3-16 inch thick.

Q. 2.—How many dry batteries are needed for it?

A. 2.—Two sets of 8 dry batteries connected in multiple.

Q. 3.—May enameled wire be used in both the primary and secondary?

A. 3.—Yes, although D. C. C. is better for primary.

WIRELESS QUERIES.

(924.) A. R. Cochran, Pa., asks:

Q. 1.—Please tell me the best hook-up for the following instruments: double slide loose-coupler, tuner, variable condenser, fixed condenser, silicon and perikon detectors, and 2,000 ohm 'phones; loop aerial being used.

A. 1.—See Query No. 909.

Q. 2.—What would be my receiving range using the above instruments and an aerial 60 feet high and 65 feet long?

A. 2.—200-250 miles.

IRON PIPE AERIAL.

(925.) R. S. Webb, Mass., says:

Q. 1.—Will you please tell me in the "Oracle" why it is that the spark of a sending station seems to die down? I can hear "NAD" very loud and suddenly it grows very faint. When I push the button on my buzzer the signals are little louder but not much. I use 2,000 ohm receivers, loose coupler, variable condenser, fixed condenser and silicon detector.

Q. 2.—How many sections and what size pipe in each section, should be used to construct an iron pipe aerial mast 80 feet high?

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Q. 3.—How would you raise an iron mast of the above length?

A. 1.—The trouble seems to lie in the piece of silicon or perhaps the contact which you use on the silicon is such that it oxidizes readily which would impose a greater resistance in the circuit and the signals would come in fainter. It may also be that there is much "Static" in the air at the time you receive or also sometimes similar trouble will arise at sunset or sunrise due to the ionizing effect of sunlight.

A. 2.—Use 25 feet of 4 inch, 25 feet of 3 inch, and 30 feet of 2 inch piping.

A. 3.—See our August, 1910, issue of "Modern Electrics."

LAMPS IN AERIAL.

(926.) Ralph G. Matthews, Chicago, Ill., writes:

Q. 1.—In one of your numbers you state that a 16 c. p. lamp will light if connected between helix and aerial. I tried this but it would not work. I have an E. I. Co. 1½ inch coil and use an electrolytic interrupter on 110 V. A. C. I use diagram No. S-50 in E. I. Co.'s catalogue. What is the matter?

A. 1.—The lamp referred to is not 110 volts lamp which you seem to think it is Lamps from 4 to 20 volts give the best effect Of course, you understand that the tuning must be perfect and you must radiate enough energy into your aerial or else the lamp will not light.

Q. 2.—My chum and I, who live about 150 feet apart, when conversing by wireless, sometimes cannot get into communication with each other. It seems as though something suddenly comes between us. This lasts for about 15 minutes and then both outfits will work fine. Please explain this and tell me how it can be remedied?

A. 2.—This question cannot be answered unless you give us details how the two stations are put up and if there are any intervening objects between the two stations.

SPARKLESS WIRELESS SYSTEM.

(927.) Earl Griffing, Cal., asks:

Q. 1.—Kindly state instruments needed for the sending side of the new sparkless system of wireless telegraphy?

A. 1.—We refer you to the August, 1909, issue of "Modern Electrics," Page 201 describing the new Sparkless System.

Q. 2.—Can the same instruments that are used in the spark system for receiving be used with good results with the sparkless?

A. 2.—The same instruments can be used

WIRELESS SCHOOL.

(928.) Alvin Lederer, New York, asks:

Q. 1.—Is there a wireless school at 42 Broadway, belonging to the United Wireless Telegraph Co., and what are their terms of instruction? If not, where is there one in New York City?

A. 1.—There is no wireless school at 42 Broadway, as far as we know.

Q. 2.—How far can I receive with the following instruments: Aerial composed of 1 No. 14 copper strand 175 feet long, 80 feet high at both ends? Instruments are detectors, two

Galena, two perikon, one silicon, and one bornite and zincite, combination, "Electro's" No. 1305 phones, rotary variable condenser, fixed condenser and long-distance wireless instrument and large three-slide tuner.

A. 2.—It is very hard to tell how far you can receive, as you are using so many detectors and only a single wire aerial, but we think that you should have little trouble to receive from 200 to 300 miles with your outfit. By using a 4-wire aerial this distance could be doubled.

FORMING CARBORUNDUM.

(929.) E. P. Whitehead, Worcester, Mass., writes:

Q. 1.—Will you please tell me if there is an instrument to keep the lightning from damaging the receiving instruments on a wireless telegraph when receiving in the summer time?

A. 1.—Short circuit all receiving instruments when not in use.

Q. 2.—Please tell me how I can make carborundum form into a large piece after it has crumbled up.

A. 2.—Carborundum is formed through intense heat and under extreme pressure, and unless you have access to an electric furnace you cannot form it into a large piece. Pure Carborundum cannot be molded; it is obtainable in crystals only.

Q. 3.—Please tell me how many meters wave length has my tuning coil if it is 4½ inches in diameter and 15 inches long, wound with No. 22 B. & S. gauge bare copper wire, with thread insulation between the wires?

A. 3.—Approximately 545 meters. You are not very definite regarding thickness of the thread insulation, and so a very definite solution is not possible.

WIRELESS QUESTIONS.

(930.) R. Van Camp, N. J., asks:

Q. 1.—Which is the better aerial, an aerial composed of four wires, or a loop aerial composed of four wires?

A. 1.—For amateur use a 4-wire straight-away aerial usually gives the best results.

Q. 2.—How many volts does a half-inch spark coil give using four batteries, helix, sending condensers, spark gap and key?

A. 2.—A ½-inch spark between needle points has a voltage of about 12,000.

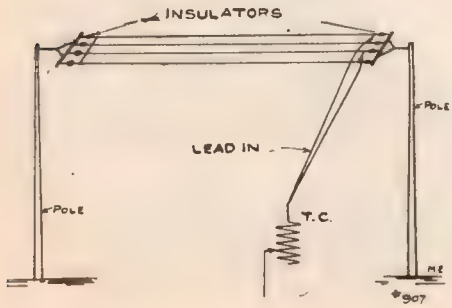
Q. 3.—How many meters wave length on a tuning coil 2¾ inches in diameter and having 240 turns of No. 24 enameled wire?

A. 3.—Approximately 375 meters.

AERIALS.

(931.) Charles Prevost, Cleveland, Ohio, writes:

Q. 1.—Please give diagrams for a 4-wire



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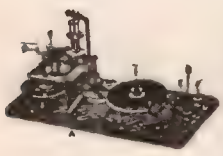

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aerial, showing insulating and connecting instruments with aerial wire.

A. 1.—See accompanying diagram.

Q. 2.—Please tell me if a 2-wire aerial like on boats will answer the purpose for a 4-wire aerial. Will aluminum wire be all right for a 2-wire aerial?

A. 2.—A 4-wire aerial will ordinarily give better results than a 2-wire aerial of the same size, owing to its greater capacity. Aluminum wire is very good to use for an aerial, on account of its light weight and ease of installing and maintaining.

VACUUM TUBE LIGHTING.

(932.) R. Fitzgerald, Toronto, Can., writes:

Q. 1.—I connected up a spark coil as shown in sketch. When the circuit was closed I placed a miniature lamp on one of the secondary terminals, only one connection of the lamp touching, and a pale blue light filled the bulb. Can you give me some idea of what takes place or why this is?

A. 1.—By referring to the September and October, 1910, issues of "Modern Electrics," you will find a very thorough treatise on this phenomena.

OPERATING RADIUS.

(933.) C. A. Mittog, Park Ridge, N. J., asks:

Q. 1.—How far can I send and receive with the following: Sending, E. I. Co.'s ¼-k.w. transformer, E. I. Co.'s special sending helix, E. I. Co.'s ¼-k.w. sending condenser, M. E. S. Co. large spark gap and wireless key; receiving, Bunell's 3-slide tuner (only 2 slides hooked up), and fixed condenser, E. I. Co.'s 1,000-ohm double head set, silicon detector (home-made), Manhattan E. S. Co.'s variable condenser, aerial 125 feet long and 90 feet high at one end and 30 feet at the other, straightaway hook-up?

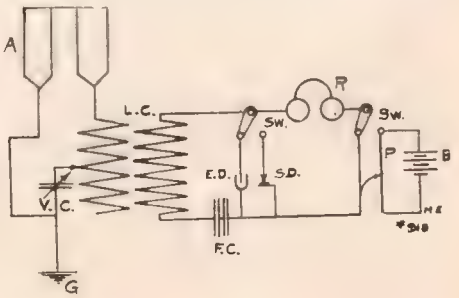
A. 1.—You should be able to send about 75 to 100 miles and receive about 800 to 900 miles.

RECEIVING RANGE.

(934.) Clarence Bischoff, Portland, Ore., asks:

Q. 1.—What is my receiving range with the following instruments: 4-wire aerial, 152 meters wave length, 60 feet high one end, 50 at other, loop type; loose coupler, tuning coil, 150 meters wave length; E. I. Co.'s double slide electro tuner, Jr. 9950; E. I. Co.'s fixed condenser, variable condenser; E. I. Co.'s electrolytic detector, potentiometer, two batteries, E. I. Co.'s receivers No. 1305?

A. 1.—600 to 800 miles.



World Radio History

Q. 2.—Kindly give me diagram how to connect above instruments with the following additions: Silicon detector, two 2-point E. I. Co.'s switches, in loop aerial form.

A. 2.—See accompanying diagram.

WIRELESS QUESTIONS.

(935.) Emory T. Johnson, Lafayette, Pa., writes:

Q. 1.—Recently I constructed two of the storage cells described in the July, 1909, "Modern Electrics." I followed directions carefully in mixing pastes for the plates. Instead of having two positive and one negative plates as desired, I have three positive and two negative plates, size 3x5 inches, and glass jars. The electrolyte in the cells is as described. For separators I used thin wood veneering. I charged the cells for 12 hours, and then discharged them through a resistance of about 50 ohms. The second time I charged them a slate colored sediment appeared in the bottom of the jars.. The cells were not used for about a week and one-half, and when I had occasion to use them they were nearly discharged. The circuit was open all the time. The plates and separators are a trifle tight in the jars. Can you tell me what the trouble is?

A. 1.—Your storage battery should have one more *negative* plate than *positive*, instead of vice versa, as you have it. The plates should have plenty of space in the containers so there will be sufficient quantity of electrolyte to act on them, and also to allow tne plates to expand when charging, or they will buckle or warp, causing the paste to fall out, as it did in your case. You should not charge your batteries too rapidly, as this will also warp the plates. They should be charged about 8 to 10 hours, i. e., a 40 A. H. battery should be charged with 5 amperes for 8 hours, and so on. The slate-colored sediment (paste) falling down between the plates, short-circuited them and therefore the battery was discharged when you wished to use it. To obviate this the plates should stand on cross ribs of glass or hard rubber ½ inch from bottom of cell.

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Wireless Association of America

THE Wireless Association of America has been founded with the sole object of furthering the interests of wireless telegraphy and telephony in America.

We are now on the threshold of the wireless era, and just beginning to rub our intellectual eyes, as it were. Sometimes we look over the wall of our barred knowledge in amazement, wondering what lays beyond the wall, as yet covered with a dense haze.

However, young America, up to the occasion, is wide awake as usual.

Foreign wireless experts, invariably exclaim in wonder when viewing the photographs appearing in each month in the "Wireless Contest" of MODERN ELECTRICS. They cannot grasp the idea that boys 14 years old actually operate wireless stations successfully everyday in the year under all conditions but they are all of the undivided opinion that Young America leads the rest of the world wirelessly.

So far America has led in the race. The next thing is to stay in the front, and let others follow. In fact he would be a bold prophet who would even dare hint at the wonders to come during the next decade. The boy experimenting in an attic to-day may be an authority to-morrow.

As stated before the Wireless Association's sole aim is to further the interests of experimental wireless telegraphy and telephony in this country.

Headed by America's foremost wireless men, it is not a money-making institution. There are no membership fees, and no contributions required to become a member.

There are two conditions only. Each member of the Association must be an American citizen and MUST OWN A WIRELESS STATION, either for sending or for receiving or both.

The Association furnishes a membership button as per our illustration. This button is sold at actual cost. Price 20 cents.

This button is made of bronze, triple silver-plated. The flashes from the wireless pole are laid in hard red enamel, which makes the button quite distinctive. The button furthermore has the usual screw back making it easy to fasten to buttonhole. The lettering itself is laid in black hard enamel. Size exactly as cut.

On account of the heavy plating it will last for years and is guaranteed not to wear "brassy." Beautiful solid gold button, $2.00.

Its diameter is 3-4 inch. This is a trifle larger than usual, the purpose being to show the button off so that it can be readily seen from a distance. The reason is obvious. Suppose you are a wireless experimenter and you live in a fairly large town. If you see a stranger with the Association button, you, of course, would not be backward talking to the wearer and in this manner become acquainted with those having a common object in mind, which is the successful development of "wireless."

The Association furthermore wishes to be of assistance to experimenters and inventors of wireless appliances and apparatus, if the owners are not capable to market or work out their inventions. Such information and advice will be given free. Somebody suggested that Wireless Clubs should be formed in various towns, and while this idea is of course feasible in the larger towns, it is fallacious in smaller towns where at best only two or three wireless experimenters can be found.

Most experimenters would rather spend their money in maintaining and enlarging their wireless stations, instead of contributing fees to maintain clubs or meeting rooms, etc., etc.

The Board of Directors of this Association earnestly request every wireless experimenter and owner of a station to apply for membership in the Association by submitting his name, address, location, instruments used, etc., etc., to the business manager. There is no charge or fee whatever connected with this.

Each member will be recorded and all members will be classified by town and State.

Members are at liberty to inquire from the Association if other wireless experimenters within their locality have registered. Such information will be furnished free if stamped return envelope is forwarded with inquiry.

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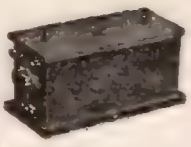

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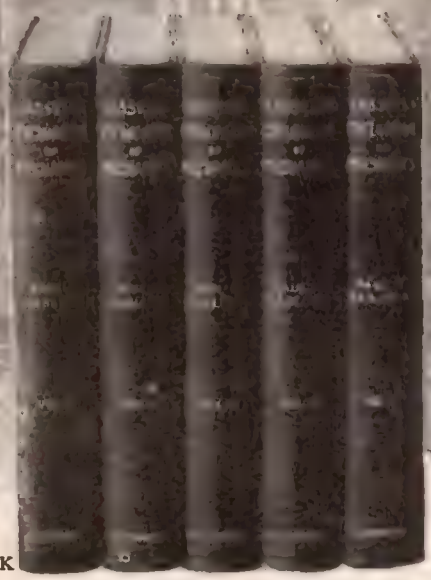

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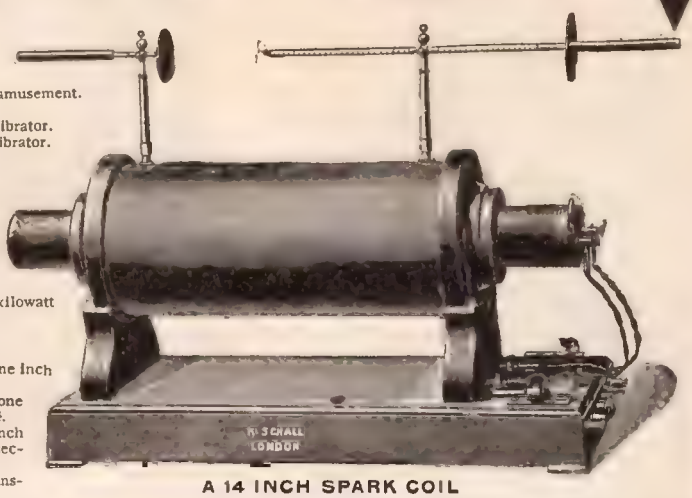

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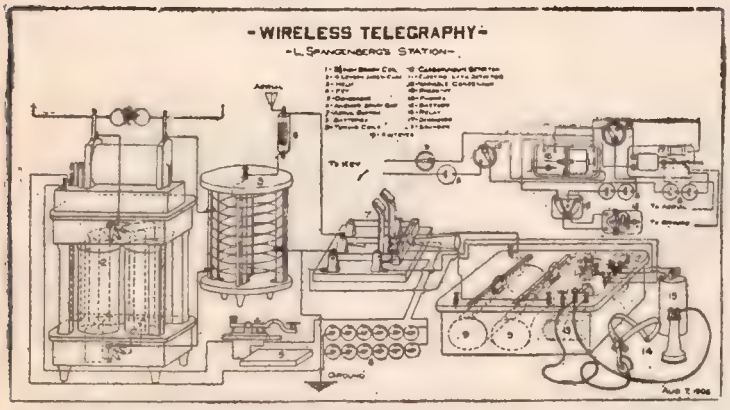

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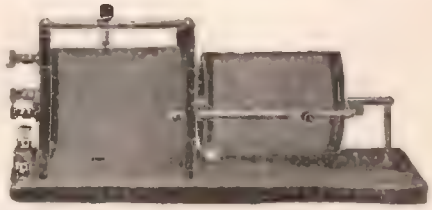

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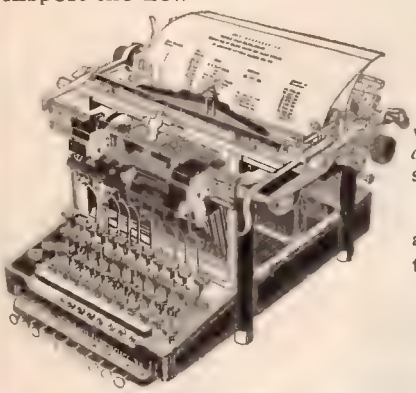

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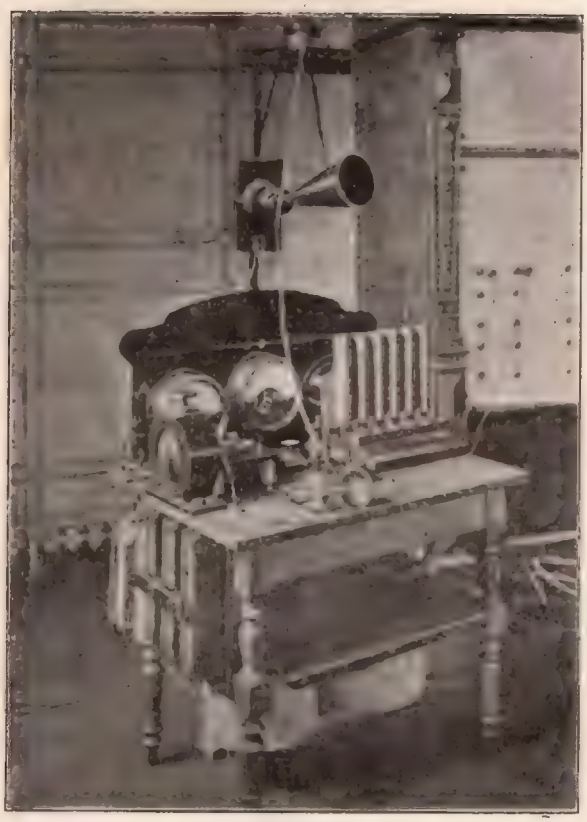

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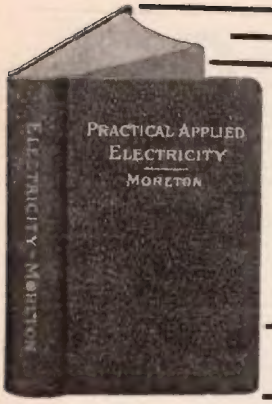

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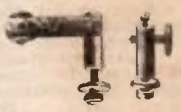

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No. 6779 Complete vibrator, **35c.** By mail extra, **3c.**

Note.—These vibrators are NOT large enough for spark coils and should only be used for medical coils or experimental work. Spark coil vibrators are listed on page 47-48 of our Catalog No. 9.

SOFT RUBBER TUBING

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8000

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It may be of interest to you to know, that I communicate with a friend in Baton Rouge every night with my ½ K. W. Transformer coil, a distance of about 70 miles air line, My coil is working excellent, and anyone wishing to buy a coil. cannot make a better move than by purchasing one like mine.

Hoping this will be good news, I remain,
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8050

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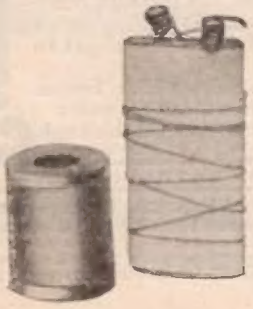

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Each article listed below is fully guaranteed. If you ever wished to make your own coil, here is a chance that comes but few times during your life. Order now before it is too late.

Please note that we guarantee spark length of secondaries ONLY when proper primary, our vibrator and our own condenser is used in connection with same.

½ in Secondary, guaranteed full spark, each..... **$0.70**
(Two of these used on one primary give 1 in. spark) By mail extra 8c
1½ in. Secondaries (two are used for 1½ in. spark) price for the two... **2.00**
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6983 E.I.Co.

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Empire Cloth, per sq. yard, No. 6983....$0.65

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6036

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No. 6181.

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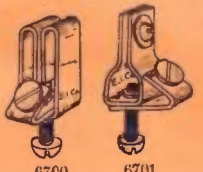

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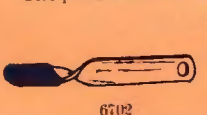

6702

6704

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